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REPORT ON THE IMMEDIATE WATER POLLUTION CONTROL NEEDS FOR THE INTERSTATE AND INTRASTATE WATERS OF THE METROPOLITAN NEW YORK REGION

Federal Water Pollution Control Administration
Metuchen, New Jersey

June 1967

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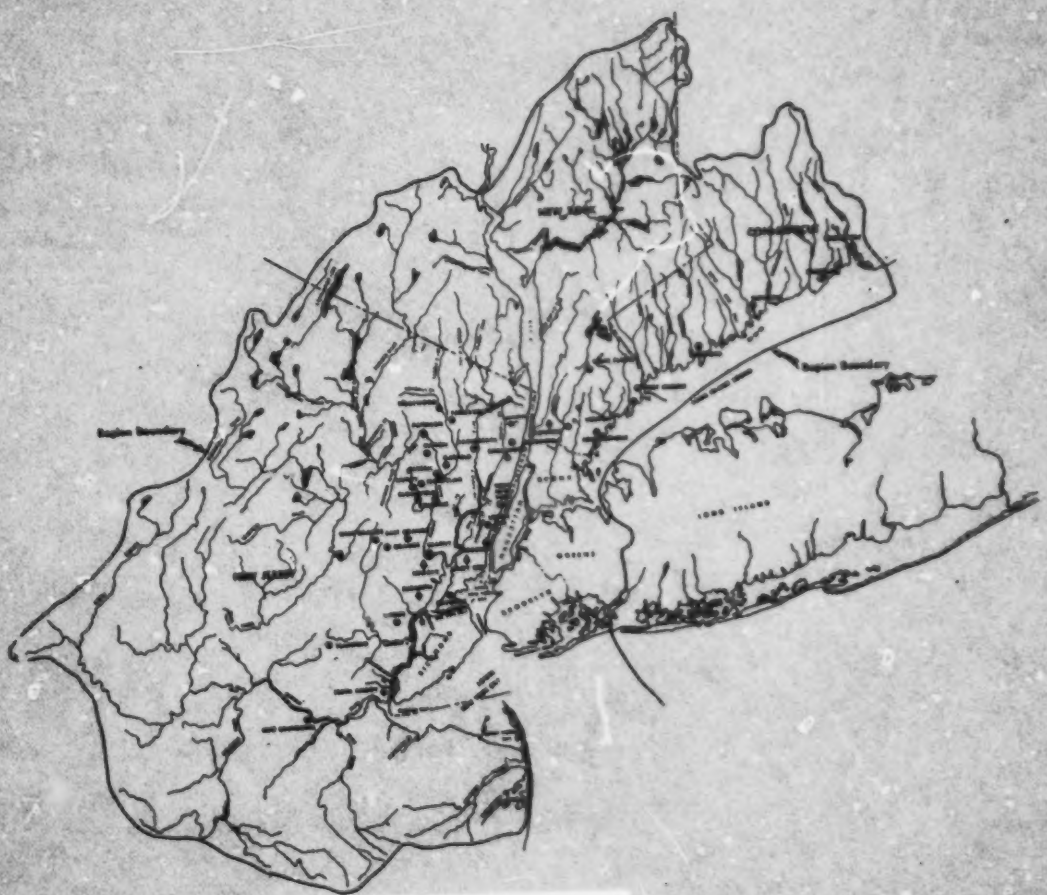

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FOR THE

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Metuchen, New Jersey

June 1967

A D D E N D A
for
Report on Immediate Water Pollution Control Needs Interstate and Intrastate Waters Metropolitan New York Region, June, 1967

More recent information obtained from the New Jersey State Department of Health has resulted in a number of modifications to the inter- and intrastate municipal construction needs reported by priority and type of corrective construction activity. These changes, listed on page 2 of this addenda, have not been incorporated in the text or tables of this report. The net effect of these modifications would be to reduce the number of municipal waste sources requiring upgrading or replacement in the New Jersey portion of the Region from 61 to 43 and to lessen the Region's total population load needful of abatement activity from 11,885,000 persons to slightly less than 11,490,000. Because abatement cost estimates for needed construction in this report are based upon plant population load, the effect of these modifications would be to reduce the total abatement costs estimates for the New Jersey portion of the Region by roughly $9,000,000.

Included in the Interstate Construction Needs are two facilities (Tallman's Island and Hunts Point, New York City) identified as overloaded secondary plants. More recent information from the Interstate Sanitation Commission indicates that these plants are not presently overloaded. The City of New York, Department of Public Works has scheduled some construction work within each plant to provide for a higher degree of treatment. The expenditures required for this work will tend to increase the cost estimates calculated for the City of New York only fractionally.

At the second session of the Hudson River Conference, held on September 20, 1967, the conferees agreed that considerable progress has been made toward abating pollution of the interstate waters of the Hudson River and its tributaries. The conferees concluded that prior to discharge to the waters of the conference area, all wastes shall (a) be treated to provide a minimum of 80 percent reduction of Biochemical Oxygen Demand (BOD) at all times, recognizing that to achieve this will require a design of 90 percent average removal of BOD, or (b) shall be treated, as approved by the State Water Pollution Control Agency, to a degree necessary to meet the water quality standards approved by the Secretary of the Interior. Effective disinfection of all treated waste effluents is required to protect water uses. The conferees also accepted the schedule requiring that all remedial facilities be operational by 1972. In addition, the State and Interstate conferees expressed concern over the failure of Congress to appropriate the total funds previously authorized for the Federal construction grants program. The conferees also agreed that periodic progress meetings shall be called by the chairman after consultation with all conferees.

Legislation passed in 1967 by New York State amended the 1966 law governing wastes from watercraft. The specific requirement that marinas must provide facilities for the handling and disposal of sewage from watercraft was deleted. According to the revised law, marina owners electing to install sewage facilities to receive the waste from watercraft must provide facilities that meet the requirements of the State Health Department.

Modifications to the Inter- and Intrastate

Municipal Construction Needs

Waste Source	Modification
Closter	Delete from listing; unsewered area.
Harrington Park	" " " " "
Haworth	" " " " "
Montvale	" " " " "
Old Tappan	" " " " "
Park Ridge	" " " " "
Rivervale	" " " " "
Washington	" " " " "
Woodcliff Lake	" " " " "
Bergen County Sew. Auth.	Delete from listing; existing treatment adequate.
Berkeley Heights	" " " " "
Caldwell	" " " " "
Essex County Institution	" " " " "
Livingston - Okner Pkwy.	" " " " "
Manville	" " " " "
Millington-Passaic Twp.	" " " " "
Raritan	" " " " "
Stirling	" " " " "
Verona Boro	" " " " "
Somerset-Raritan Valley Sew. Auth.	Delete from listing; primary plant effluent discharges into private activated sludge waste treatment facility.
N. Bergen Twp.-North	Change Construction Activity Code to 02.
N. Bergen Twp.-Central	" " " " " "
Chatham-Madison Jt. Meeting	" " " " " 06
Cedar Grove Twp.	" " " " " 07
Helmetta (Helm Products Co.)	" " " " " 07
Wanaque	" " " " " 08
Totowa Boro (West)	Add to listing in Priority II and Construction Activity Code 08. Population served, 3,800.

Federal Construction Need

Bayonne Navy Depot (Now Army Facility)	Add to listing in Priority III and Construction Activity Code 04.

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INTRODUCTION

This report reviews the water pollution problems in the Metropolitan New York Region, which is defined to include the drainage basins of all streams entering the Hudson River south of the southern boundaries of Orange and Putnam Counties; entering and including Raritan, Newark and New York Bays; and entering the north side of Long Island Sound west of the Housatonic River Basin. The Region lies chiefly in New Jersey and New York, but includes a small portion of Connecticut. The discharge of waste from municipalities, industries and numerous other sources degrades water quality and prevents full utilization of this natural resource throughout the Region.

The purpose of this report is to delineate those actions which should be undertaken immediately to prevent further degradation and to provide enhancement of these waters. These actions include not only construction of new or improved municipal and industrial waste treatment facilities, but also studies, surveys and research which are needed to develop sound water quality management programs for the future.

The recommendations included in this report are based upon a preliminary analysis of the data obtained from published reports, from state agency files, and from the files of the Federal Water Pollution Control Administration. The recognition of the inadequacy of these data indicates the need for additional studies and for field surveys to augment available information and to further verify the contents of this report. In preparing these recommendations the needed construction activities were determined in order of priority of urgency, using the available data and a scoring procedure described in the Appendix.

This report has been prepared under the authority of the provisions of the Federal Water Pollution Control Act, as amended, and in accordance with Presidential Executive Order 11288, "Prevention, Control and Abatement of Water Pollution by Federal Activities."

II - SUMMARY AND CONCLUSIONS

1. The Metropolitan New York Region includes the drainage basins of all streams entering the Hudson River south of the southern boundaries of Orange and Putnam Counties; entering and including Raritan, Newark and New York Bays; and entering the north side of Long Island Sound west of the Housatonic River Basin. The inter- and intrastate waters receive the discharge of wastes from municipal collection and waste treatment systems, factories, individual sewerage systems, boating and land drainage. As a result, these waters are polluted with bacteria, organic wastes, suspended solids, toxic chemicals and nutrients.

2. The governmental agencies within the Region which have direct responsibility for water pollution control are the New York State Department of Health, the Interstate Sanitation Commission, the Connecticut Water Resources Commission, the New Jersey State Department of Health, and the Federal Water Pollution Control Administration.

3. Pollution of these waters not only presents a hazard to the health of persons using them for water supply and water contact recreation, but also restricts full utilization for fish and wildlife, industrial and agricultural needs, and presents an unsightly and objectionable appearance.

4. The major sources of pollution of these waters are raw and inadequately treated municipal and industrial wastes. There are 113 known municipal, institutional and Federal sources of waste which affect interstate or intrastate waters and which require pollution abatement action. Major industrial sources include the food and beverage industry, metal operations, textile products, chemical processing, heavy and light manufacturing operations, and non-ferrous metal refining.

5. The interstate waters of the Region are affected by the discharge of inadequately treated wastes from 92 municipal, institutional and Federal facilities. Of the municipal sources, 22 provide no treatment and an additional 15 have primary plants which are obsolete. Fifty-nine municipalities fail to disinfect wastewater.

6. There are 21 municipal sources degrading intrastate waters within the Region. Of the municipal sources, three discharge with no treatment and two are primary treatment plants that are obsolete.

7. To achieve satisfactory water quality, all municipal and industrial sources should receive a minimum of secondary treatment which is defined as 90 percent BOD removal and 95 percent removal of suspended solids. In addition, all municipal and most industrial wastes should receive effective disinfection. In certain cases, removal of nutrients and toxic materials are required in addition to the above. These criteria served as guidelines to determine immediate construction needs and to calculate cost estimates for this report.

8. A summary of immediate needs costs to correct municipal and Federal sources of pollution on inter- and intrastate waters in each of four major areas that make up the Metropolitan New York Region is presented in Table II-1, page II-5.

9. The estimated cost to abate municipal pollution of the interstate waters through 1990 totals $759,000,000, with the major portion ($251,000,000) required to correct raw waste discharges. The estimated cost to abate the pollution of the intrastate waters totals $15,590,000, of which only $2,800,000 is needed to correct raw discharges. Estimates of engineering costs and ancillary work are included in these facilities cost estimates.

10. Industries discharging wastewater are estimated to exceed several thousand throughout the Metropolitan New York Region. More than 275 establishments have been identified as requiring urgent abatement action. It must be emphasized, however, that it is impossible to determine the extent and cost of the corrective abatement action needed without the findings of a comprehensive inventory of industrial waste sources throughout the Region.

11. In addition to the waste discharges from municipalities and industries, water quality within the Region is degraded to an unknown degree by wastes from such sources as individual septic tanks and cesspools, combined sewers and urban runoff, recreational and commercial boating, agricultural runoff, by heat from power plants and industries, and by natural aging and enrichment of the lakes.

12. To make possible the control of pollution from these sources, and to ensure the funds expended as above for immediate construction activity result in improvement of water quality, additional legislation, studies and planning will be required.

13. The State of Connecticut should adopt and implement laws that will:

a. Establish a state-wide sampling and monitoring program;

b. Provide for adequate operation and maintenance of waste treatment plants, including licensing of operators.

The States of New York and New Jersey should expand their manual and automated surveillance network. New Jersey should require more effective operation and maintenance of waste treatment plants. New Jersey must also revise and implement laws that will prohibit dumping of litter and disposal of untreated wastes from watercraft into the tidal waters.

14. The Federal Water Pollution Control Administration could assist current state programs by undertaking cooperative studies, surveys and research in the following areas:

a. Location of areas with high densities of individual septic tanks and cesspools, and the effects of such systems on surface and ground water quality;

b. Effects of stormwater overflow and urban runoff on water quality, and methods to control such sources;

c. Field sampling and laboratory analyses to determine present water quality in those areas where existing data are inadequate;

d. Types and amounts of agricultural chemicals used in the Region, with a determination of the effects of runoff of such pollutants on the receiving waters;

e. Location of areas with obnoxious growths of aquatic weeds and algae, with control measures to reduce nutrient inflow to such waters as well as to eliminate present problems by physical removal or chemical control;

f. Location and extent of thermal pollution problems;

g. Accurate and current inventories of all sources of municipal and industrial waste, to include waste volumes and characteristics;

h. Feasibility of joint municipal-industrial treatment facilities, to include any needed pre-treatment of industrial waste;

i. Comprehensive basin planning to coordinate releases from water resources development structures to enhance water quality during periods of critical low stream flow;

j. Magnitude of the problem of pollution by recreational and commercial boats, to include oil pollution, and needed control procedures to abate this source of pollution;

k. Training of both waste treatment operators and surveillance personnel to assure maximum treatment efficiencies;

l. Extent of water quality degradation due to dredging and associated activities to include coordination of Federal, state, local and private interests in dredging operations.

15. Each state should undertake additional studies, surveys and programs to cover the following:

a. Projects designed to replace ineffective individual waste disposal systems by municipal collection and treatment facilities;

b. Inventory boat marinas to determine the adequacy of present on-shore treatment devices; and the need for such devices to handle waste from recreational boating.

16. An investigation of the existing legal and institutional arrangements which deal with water quality problems on a local, regional or statewide basis must be undertaken to determine their adequacy in effecting and implementing water pollution control programs.

17. Investigations must be carried out to determine the fiscal contribution of each basin entity (government and private) to meet expenditures required for immediate and long range pollution control and resource management programs. The role of Federal, State, local and private bodies must be evaluated in terms

of costs and benefits. An indication of the economic impact water pollution abatement may have on the Region as a whole should be determined if programs aimed at achieving better water quality are to receive an appropriate share of public and private expenditures.

18. The need for close coordination of water quality problems indicates that a regional approach is best suited to promote inter-local cooperation between municipalities, to coordinate planning among townships and counties, and to administer State and Federal programs. Regional water management authorities must ensure that the needs of the minor or tributary river basins are reviewed, weighed and/or integrated into the major river drainage basin programs.

TABLE II-1

SUMMARY OF COST DATA FOR MUNICIPAL WASTE SOURCE ABATEMENT
THROUGH 1990 FOR INTER- AND INTRASTATE WATERS,
METROPOLITAN NEW YORK REGION

	Interstate		Intrastate		Total	
Priority [a]	Number Plants	Cost ($000)	Number Plants	Cost ($000)	Number Plants	Cost ($000) [c]
I	26	318,630	7	5,850	33	324,480
II	40	286,100	14	9,740	54	295,840
III	26	154,200	-	-	26	154,200
TOTAL	92	758,930	21	15,590	113	774,520
Construction Activity Code [b]						
01	22	250,930	3	2,750	25	253,680
02	15	105,600	2	1,520	17	107,120
04	43	171,400	12	8,960	55	180,360
05	6	175,700	-	-	6	175,700
06	2	4,000	2	1,320	4	5,320
07	3	50,400	-	-	3	50,400
08	1	900	2	1,040	3	1,940
TOTAL	92	758,930	21	15,590	113	774,520
New York City	23	498,930	-	-	23	498,930
Other New York State	21	53,800	2	1,520	23	55,320
New Jersey (12 Counties)	43	187,500	18	13,670	61	201,170
Connecticut (1 County)	5	18,700	1	400	6	19,100
TOTAL	92	758,930	21	15,590	113	774,520

a/ See Appendix A for priority criteria.

b/ See Appendix B for Construction Activity Code.

c/ See Appendix C for cost estimating procedures.

III - IMMEDIATE CONTROL NEEDS

To determine the immediate corrective actions necessary to ensure the preservation, development and enhancement of the natural waters within the Metropolitan New York Region an evaluation was made of immediate needs of each known municipal and Federal waste source. Because of the enormous concentrations of industrial plants and diversified operations in the Metropolitan New York Region, it is impossible to determine the extent and cost of corrective abatement action required without the results of an elaborate and comprehensive inventory of industrial waste discharges. Consequently, the pragmatic review of industrial waste sources presented in this report is based largely on a general knowledge of the area and practical sanitary engineering judgment. Each industrial waste source was broadly graded according to its estimated pollutional significance. Other water pollution control needs including research and field studies are discussed in Section IV of this report.

In developing the needed construction activity for municipal and Federal waste sources, it was recognized that secondary treatment was the minimum permissible to provide that the demand for such water uses as water supply, recreation and sport fishing, commercial fin and shellfishing could be met. Using this criteria, as well as such additional factors as dilution water available, strength and volume of waste discharges, existing treatment and use of the receiving water, a system of priorities was formulated to identify the most significant problem areas.

All waste sources requiring corrective action were classified into one of four priority groupings ranked in descending order of urgency. Further details on the criteria used to develop these priorities are in the Appendix, but in general, those sources with relatively high population equivalents in terms of BOD loading, those with little or no treatment and those which discharge into streams which have only small amounts of dilution water were assigned the highest priorities.

The following sections outline immediate municipal and Federal construction needs, cost estimates and priority for interstate and intrastate waters of the Metropolitan New York Region. Also included is a brief outline of selected industrial wastes for New York City and by State as well as a table of their estimated pollutional urgency.

INTERSTATE CONSTRUCTION NEEDS

The interstate waters of the Metropolitan New York Region are affected by 86 known municipal and six known Federal waste sources requiring some type of immediate construction activity. These serve an estimated 11,800,000 persons, 60 percent of which are handled by New York City treatment plants. Fifty-nine sources provide no wastewater disinfection.

Needs By Priority

Table III-1 summarizes the needed construction activity by priority of urgency. Table III-2 identifies the specific sources in each priority by state and for the City of New York.

Priority I, those waste sources demanding the most urgent attention, includes 20 municipal and six Federal waste sources. The municipal sources discharge a waste load equivalent to that of 3,300,000 persons. These sources are distributed as follows: four in New York State, three of which are in New York City and 16 in New Jersey. The raw, unchlorinated discharges from the New York City facilities (Red Hook, Brooklyn; North River, Manhattan; parts of the Port Richmond and Oakwood Beach areas of Staten Island) are among the largest, amounting to roughly half the organic load in this most urgent Priority. The largest source of pollution is the overloaded primary treatment facility of the Passaic Valley Sewerage Commissioners, serving 1,200,000 persons. This facility does not disinfect its wastes prior to discharge into the New York Upper Harbor. Nine other raw discharges, located in New Jersey, are included in this priority. Six Federal sources, all located in New York City, discharge raw wastes from an estimated total of 8,500 persons.

Priority II includes 40 municipal systems, 15 in New York, 20 in New Jersey and five in Connecticut, serving an aggregate population of 5,200,000 persons. A majority of these systems (24) provide primary treatment for the wastes of approximately 136,000 persons. Eight other plants, built to provide primary treatment, are presently obsolete and require replacement with new secondary facilities. One secondary plant in New York City (Hunts Point), serving about 800,000 persons is overloaded. Another secondary plant in the city (Wards Island) serving roughly 1,500,000 persons, is in need of more efficient operation. In addition, there are four collection systems discharging raw sewage: Tottenville and St. George West in New York City, and Elizabeth and West New York in New Jersey. Two facilities: an intermediate (Owls Head, New York City), serving 800,000 persons and a secondary (Totowa Boro, N. J.) serving 7,000 people are overloaded and in poor condition requiring a completely new secondary plant.

Included in Priority III are 26 municipal systems which handle the wastes from an estimated 3,300,000 persons. Eight inadequate New York City facilities (one primary, five intermediate and two secondary) make up the largest plants in this Priority and account for a population waste load of 2,800,000. One of the secondary facilities, the Tallmans Island plant, is presently overloaded and the other Bowery Bay, is operating at plant efficiency significantly below its design capability. Available data indicate that modification of operational procedures could improve the plant's efficiency. New Jersey has seven plants in this Priority serving 440,000 persons. The remaining 11 plants in New York State (outside New York City) are small primary operations serving somewhat more than 47,000 persons. Five can be upgraded to secondary, whereas six others must be replaced with completely new secondary facilities.

Needs By Type of Construction

Table III-1 summarizes immediate construction needs in the interstate waters by type of construction required. Table III-3 presents detailed needs by source for both municipal and Federal systems. Approximately 1,500,000 persons are served by 16 municipal and six Federal collection systems which provide no treatment; these collection systems require construction of complete secondary treatment facilities. Four New York City systems noted in Priority I above account for most of the raw discharges; the remaining sources are small with a waste load of 25,000 or fewer persons each. There are 15 obsolete primary plants serving an estimated 2,000,000 persons which must be replaced with completely new secondary facilities. The largest and most inefficient plant in this group is the Passaic Valley facility, which treats a waste load of 1,200,000 persons.

There are 43 primary plants and six intermediate plants serving about 4,700,000 persons which must be upgraded to provide secondary treatment. Twenty-one of these plants serving approximately 3,200,000 persons are located in New York, 24 serving 1,300,000 persons in New Jersey and four serving 191,000 persons in Connecticut.

There are two substantially overloaded secondary plants in New York City serving almost 1,200,000 persons that must be upgraded. In addition, three other secondary facilities (serving 2,500,000 persons) require revised operational procedures to improve treatment efficiency. These inefficient plants are: Bowery Bay and Wards Island in New York City and the Bergen County Sewer Authority system in New Jersey.

Immediate Construction Costs, Interstate Waters

The estimated costs of the municipal construction needs for interstate waters are summarized in Tables III-4 (all facilities except New York City) and III-5 (New York City). To finance this program of immediate pollution abatement of the interstate waters in the Metropolitan New York Region will require an estimated expenditure of at least $750,000,000. Of this total, 66 percent is needed to provide adequate secondary treatment and chlorination to the municipal waste sources in New York City; the balance is to provide treatment to the remaining interstate sources of the Region. The costs include plant capacity sufficient to serve the population projected to 1990. Details on the procedure used for cost estimation are in the Appendix.

More than one-third of the municipal costs must be expended to eliminate raw discharges by providing new secondary treatment facilities.

INTRASTATE CONSTRUCTION NEEDS

There are 21 municipal waste sources which discharge raw or inadequately treated waste to the intrastate waters of the Metropolitan New York Region. Eighteen of these sources, representing an estimated sewered population of 110,000 persons, are in New Jersey, two with a sewered population of 5,100 persons are in New York and one serving 2,500 persons is in Connecticut. Of the 21 sources, six fail to disinfect their wastes.

Needs By Priority

Table III-6 summarizes the immediate construction needs for intrastate waters by priority of urgency. Table III-7 presents, by priority, each individual source. Included under Priority I are seven municipal systems that serve approximately 30,000 persons. Three of these are collection systems in New Jersey discharging raw the wastes of approximately 13,000 persons. Another facility serving 5,000 New Yorkers, that was constructed to provide primary treatment, is now obsolete and requires replacement with a new secondary treatment plant.

Included in Priority II are 14 waste sources, 12 of which are in New Jersey providing at least primary treatment.

Needs By Type of Construction

Construction needs by type are summarized in Table III-6, while Table III-8 itemizes needed municipal construction. Three municipal sources discharge the untreated waste of about 13,000 persons and require construction of complete secondary treatment and chlorination facilities. Two existing primary plants are now obsolete and must be abandoned and replaced by new secondary treatment works, while 12 other primary facilities are suitable for expansion and upgrading to secondary treatment. In addition, there are four overloaded secondary treatment plants; two of which require construction for the overload only. The two other facilities are suspected of being in poor condition and require complete new secondary facilities for the total load.

Immediate Construction Costs, Intrastate Waters

The estimated costs to construct the needed municipal treatment facilities to abate wastes discharged to intrastate waters are presented in Table III-9. The total cost for pollution control needs on intrastate waters is estimated to be $15,600,000, of which municipal construction activity in New Jersey will require $13,700,000 or 88 percent of the total.

More than half of the municipal costs must be expended to upgrade primary facilities to a level of secondary treatment, or to construct entirely new secondary treatment facilities for those primary plants now obsolete.

INDICATED INDUSTRIAL NEEDS

The Metropolitan New York Region is one of the most heavily industrialized in the world. Industries in the Region are estimated to exceed several thousand. Unfortunately, data are insufficient at present to accurately identify all these establishments and determine their waste characteristics, flow and point of discharge. Recent FWPCA reports, New York State River Drainage Basin Survey Reports and New York City publications and records do, however, provide some data regarding the general industrial waste source situation in the Region.

Industry in New York City consists to a large degree of many small to medium sized manufacturers of diversified products. Some heavy industrial activities are, however, found in the city. Based on information provided by the New York City agency handling sewer surcharges (Bureau of Water Pollution Control) a breakdown of industrial operations discharging into the city collection system follows:

a) Minor contributors of suspended or organic materials (within surchargeable limits or small volume, e. g., discharges with less than 350 ppm suspended solids and/or 300 ppm BOD) number about 4,200;

b) Surchargeable contributors (discharges with greater than 350 ppm suspended solids and/or 300 ppm BOD) number about 600; and

c) Toxic contributors (discharges requiring pre-treatment) number about 2,500.

Organic material discharged by establishments included in a) and b) above is estimated to range between 300,000 and 400,000 lbs. of BOD a day. Industries contributing the greatest share of this BOD load are (1) brewing, (2) sweet goods baking, (3) laundering, (4) pharmaceuticals, (5) milk processing, (6) meat processing and (7) soft drink bottling. The City pollution agency also indicated that the toxic waste contributors were primarily (1) metal finishing, (2) lithographic, and 3) paint manufacturing operations.

Approximately 150 industrial facilities in New York City are discharging raw wastes directly into the estuary waters. The majority of these waters may be grouped into the following industries: (1) petroleum (2) transportation (3) metal working (4) power generation (5) sugar refining (6) textile operations (7) sand and gravel operations (8) asphalt preparations (9) non-ferrous metal refining (10) soft drink bottling (11) rendering and tallow manufacturing (12) brewing and (13) detergent manufacturing.

It is estimated that the industries discharging wastewater directly into the surrounding waters account for about 150,000 lbs. of BOD each day. In addition, the wastes from petroleum terminals (leaks, spillage and surface runoff) contain oils, greases and organic solvents. Many of these firms utilize oil separators. However, a number of these are ineffective.

Industries in New Jersey that discharge wastes into Raritan Bay and Arthur Kill are estimated to contribute a BOD loading equivalent to about 560,000 persons. Untreated, and/or partially treated, wastes from 19 industries are discharged into the Arthur Kill. It is estimated that these industries impose a daily BOD load equivalent to 545,000 persons and expel 10 tons of oil and 5 tons of phenol. The Arthur Kill also receives some 200 billion BTU's from three steam generating plants. Raritan Bay receives the waste load equivalent to 15,000 persons from one industrial firm.

It is estimated that there are approximately 150 establishments with 50 and more employees creating significant pollution problems along the Hudson between the New York City line and the southern lines of Orange-Putnam Counties. A number of these firms operate inadequate treatment facilities. Nearly all of the waste offenders can be grouped into one of the following industrial categories: (1) pharmaceutical, (2) automobile manufacturing, (3) organic and fine chemical manufacturing, (4) wire and cable manufacturing, (5) food processing, (6) fuel handling and (7) textiles. In terms of BOD loading into the Hudson, it is estimated that these firms discharge a total waste equivalent to roughly one million persons.

At least 10 industries discharge pollutional wastes and two power stations may be releasing thermal pollution into the Raritan River. Several of these facilities have some type of treatment; others will probably connect into municipal sewer systems. The organic waste load (BOD) from all industrial sources on the Raritan is estimated at 70,000 lbs. a day (420,000 population equivalents). The utilities' cooling water releases contain an estimated 25 billion BTU's per day.

Industrial discharges in the Passaic River Basin account for an estimated BOD loading equivalent to 50,000 people. More than three-quarters of this load is discharged into the intrastate waters of the Whippany and Rockaway Rivers.

Five industrial operations with varying degrees of wastewater treatment are located on the tidal portion of the Hackensack River. Their combined estimated BOD load is equivalent to 40,000 persons. Although 10 other firms are also listed as discharging into the fresh water portion of the Hackensack, no information is available regarding their wastes nor the type of treatment, if any, that may be provided.

A Federal industrial wastewater inventory of 1961 indicated that there were at least 38 industrial facilities with 50 or more employees discharging directly into the streams, bays and waters on the northern side of Long Island Sound west of the Housatonic River Basin. Nine of these may be providing satisfactory treatment, 12 were providing some treatment and the remainder no treatment.

Industry in the Connecticut Coastal Area west of the Housatonic River Basin is composed largely of plants involved in the fabrication of electrical, mechanical or other metal products. The waste load from these facilities comes mainly from metal finishing operations such as plating, anodizing, pickling, stripping, bright dipping and cleaning, as well as from machining. The contaminants embody oil, grease and solvents in addition to such toxic substances as heavy metals and cyanides. Other industries of significance are (1) food and kindred products, (2) primary metals, (3) chemical and allied products and (4) textiles.

Table III-10 presents a compilation of selected industrial waste sources by industry and estimated pollutional urgency. These data, which are arrayed by major Standard Industrial Classification (SIC) manufacturing categories and grouped by major subarea, provide a quick review of the most significant industrial problems by location and industry (cf. SIC 28 in suburban counties of New York State). The enumerations presented in Table III-10 are based largely on a general knowledge of suspected waste sources in the area and the priority determinations on practical sanitary engineering judgment. The name and location of each waste source summarized in the table are on file with this agency. It is impossible to determine the extent and cost of corrective abatement required without the results of an elaborate and comprehensive inventory of industrial waste sources throughout the Region.

TABLE III-1

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY AND CONSTRUCTION ACTIVITY
INTERSTATE WATERS, METROPOLITAN NEW YORK REGION, MUNICIPAL AND FEDERAL SOURCES
SUMMARY [a]

Priority [b]	New York		New Jersey		Connecticut		TOTAL	
	Number Plants	Pop. Served	Number Plants	Pop. Served	Number Plants	Pop. Served	Number Plants	Pop. Served
I	10	1,361,450	16	1,946,400	-	-	26	3,307,850
II	15	3,833,740	20	1,087,800	5	261,300	40	5,182,840
III	19	2,834,630	7	442,000	-	-	26	3,276,630
IV	-	-	-	-	-	-	-	-
	44	8,029,820	43	3,476,200	5	261,300	92	11,767,320 [d]

Construction Activity Code [c]								
01	11	1,376,450	11	94,500	-	-	22	1,470,950
02	8	53,900	6	1,778,500	1	70,000	15	1,902,400
04	15	777,270	24	1,296,200	4	191,300	43	2,264,770
05	6	2,432,200	-	-	-	-	6	2,432,200
06	2	1,170,000	-	-	-	-	2	1,170,000
07	2	2,220,000	1	300,000	-	-	3	2,520,000
08	-	-	1	7,000	-	-	1	7,000
	44	8,029,820	43	3,476,200	5	261,300	92	11,767,320 [d]

[a] See Table III-2 and III-3 for listing of individual sources.
[b] See Appendix A for priority criteria.
[c] See Table III-3 for identification of Construction Activity Code.
[d] Total of known population served.

TABLE III-2

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY
INTERSTATE WATERS, METROPOLITAN NEW YORK REGION

Waste Source	Construction Activity Code [a]	Population Served
	Priority I [b]	
New York City		
A. Municipal		
Red Hook	01	235,000
Staten Island (Port Richmond, Oakwood Beach Areas)	01	100,000
Manhattan (N. River)	01	1,000,000
		1,335,000
B. Federal		
Military Medical Supply Agency, Kings Co.	01	400
Brooklyn Army Terminal, Kings Co.	01	3,000
Fort Jay, New York Co.	01	300
Bethlehem Steel Co., Richmond Co. (U. S. Navy)	01	300
Coast Guard Base, St. George, Richmond Co.	01	250
U.S.P.H.S. Hospital, Richmond Co.	01	1,500
		8,450
New York State		
A. Municipal		
Peekskill	04	18,000
		18,000
New Jersey		
A. Municipal		
Park Ridge	01	6,400
Woodcliff Lake	01	2,600
Old Tappan	01	2,400
Harrington Park	01	3,600
North Bergen Township - North	04	15,200
North Bergen Township - Central	04	30,000
Montvale	01	3,300

TABLE III-2

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY
INTERSTATE WATERS, METROPOLITAN NEW YORK REGION (Cont'd)

Waste Source	Construction Activity Code [a]	Population Served
	Priority I [b] (Cont'd)	
New Jersey (Cont'd)		
A. Municipal (Cont'd)		
Passaic Valley Sewerage Commissioners	02	1,200,000
Middlesex County Sewerage Authority	04	330,900
Jersey City (West)	04	300,000
Manville	04	8,600
N. Arlington - Lyndhurst Joint Meeting	04	20,200
Haworth	01	3,200
Washington	01	5,900
Hillsdale	01	8,500
Rivervale	01	5,600
		1,946,400
		3,307,850
	Priority II [b]	
New York City		
A. Municipal		
Owls Head	05	800,000
Tottenville	01	8,000
Port Richmond	04	60,000
Hunts Point	06	770,000
Wards Island	07	1,470,000
St. George - West	01	25,000
		3,133,000
New York State		
A. Municipal		
Ossining - Water Street	02	14,000
W. Haverstraw	02	5,000
Blind Brook (Rye)	04	18,000
New Rochelle	04	70,000
Mamaroneck	04	125,000
Tuxedo Park Twp.	04	2,000
Orangetown SD 2	04	3,500

TABLE III-2

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY
INTERSTATE WATERS, METROPOLITAN NEW YORK REGION (Cont'd)

Waste Source	Construction Activity Code [a]	Population Served
	Priority II [b] (Cont'd)	
New York State (Cont'd)		
A. Municipal		
Port Chester	04	23,000
Yonkers	04	440,240
		700,740
New Jersey		
A. Municipal		
Matawan Boro	04	3,600
Somerset - Raritan Valley Sew. Auth.	04	11,500
Rahway Valley Sewerage Auth.	02	115,000
Linden-Roselle Sewerage Auth.	04	52,500
Jersey City (East)	04	180,100
Elizabeth Joint Meeting	02	415,000
Atlantic Highlands	02	4,200
Keansburg	04	7,500
Keyport	04	7,000
Perth Amboy	02	41,300
Totowa Boro (Riverview)	08	7,600
Elizabeth	01	15,000
Bayonne	04	75,000
Woodbridge - Sewaren	04	30,000
Highlands	02	3,000
Sayreville - Morgan	04	2,000
South Amboy	04	8,400
Edgewater	04	21,700
West New York	01	38,000
West New York - Joint Meeting	04	50,000
		1,087,800
Connecticut		
A. Municipal		
Stamford	02	70,000
Darien	04	6,300
Bridgeport Plant #1	04	40,000
Bridgeport Plant #2	04	90,000
Norwalk	04	55,000
		261,300
		5,182,840

TABLE III-2

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY
INTERSTATE WATERS, METROPOLITAN NEW YORK REGION (Cont'd)

Waste Source	Construction Activity Code [a]	Population Served
	Priority III [b]	
New York City		
A. Municipal		
Harts Island	04	5,000
Rockaway	05	70,000
Oakwood Beach	05	60,000
26th Ward	05	316,000
Tallmans Island	06	400,000
Bowery Bay	07	750,000
Coney Island	05	604,000
Jamaica	05	582,200
		2,787,200
New York State		
A. Municipal		
Irvington	04	4,000
Haverstraw (V)	02	6,000
Croton-On-The-Hudson	04	4,000
Nyack	02	5,300
N. Tarrytown	02	9,100
S. Nyack	02	3,200
Tarrytown	02	9,800
Upper Nyack	04	730
Ossining - Liberty Street	04	2,000
Ossining Dept. of Correction	04	1,600
Piermont	02	1,500
		47,430
New Jersey		
A. Municipal		
Carteret	04	15,000
Kearny	04	40,000
Woodbridge - Keasby	04	8,000
Bergen County Sewer. Auth.	07	300,000
Sayreville - Melrose	04	1,000
Hoboken	04	70,000
Lawrence Harbor	04	8,000
		442,000
		3,276,630
	TOTAL	11,767,320 [c]

[a] See Table III-3 for definitions of Construction Activity Code.
[b] See Appendix A for priority criteria.
[c] Total of known population served.

TABLE III-3

IMMEDIATE CONSTRUCTION NEEDS BY TYPE
INTERSTATE WATERS, METROPOLITAN NEW YORK REGION
MUNICIPAL AND FEDERAL NEEDS

Waste Source	Population Served
Code 01: Discharging raw sewage. Build secondary plant.	
New York City	
A. Municipal	
Red Hook	235,000
Staten Island	100,000
Manhattan	
North River	1,000,000
Tottenville	8,000
St. George West	25,000
	1,368,000
B. Federal	
Military Medical Supply	400
Brooklyn Army Terminal	3,000
Fort Jay	3,000
Bethlehem Steel Co.	300
Coast Guard Base	250
U.S.P.H.S. Hospital	1,500
	8,450
New York State	
None	
New Jersey	
A. Municipal	
Park Ridge	6,400
Woodcliff Lake	2,600
Old Tappan	2,400
Harrington Park	3,600
Montvale	3,300
Haworth	3,200
Washington	5,900
Hillsdale	8,500
Rivervale	5,600
Elizabeth	15,000
West New York	38,000
	94,500
	1,470,950

TABLE III-3 (Cont'd)

Waste Source	Population Served
Code 02: Not suitable for upgrading to secondary. Build new primary and upgrade to secondary.	
New York	
A. Municipal	
Piermont	1,500
Ossining - Water Street	14,000
West Haverstraw	5,000
Haverstraw	6,000
Nyack	5,300
North Tarrytown	9,100
South Nyack	3,200
Tarrytown	9,800
	53,900
New Jersey	
A. Municipal	
Passaic Valley Sewerage Comm.	1,200,000
Rahway Valley Sewerage Auth.	115,000
Elizabeth Joint Meeting	415,000
Atlantic Highlands	4,200
Perth Amboy	41,300
Highlands	3,000
	1,778,500
Connecticut	
A. Municipal	
Stamford	70,000
	70,000
	1,902,400
Code 04: Primary plant suitable for upgrading. Build secondary facilities.	
New York City	
A. Municipal	
Port Richmond	60,000
Harts Island	5,000
	65,000
New York State	
A. Municipal	
Peekskill	18,000
Mamaroneck	125,000
Tuxedo Park	2,000
Orangetown SD #2	3,500
Port Chester	23,000
Yonkers	440,240
Blind Brook (Rye)	18,000
New Rochelle	70,000

TABLE III-3 (Cont'd)

Waste Source	Population Served
Code C-: Primary plant suitable for upgrading. Build secondary facilities. (Cont'd)	
Irvington	4,000
Croton-on-the-Hudson	4,000
Upper Nyack	730
Ossining - Liberty Street	2,000
Ossining Department of Correction	1,800
	712,270
New Jersey	
A. Municipal	
North Bergen Township - North	15,200
North Bergen Township - Central	30,000
Middlesex County Sew. Auth.	330,900
Jersey City (West)	300,000
Manville	8,600
North Arlington - Lyndhurst Joint Meeting	20,200
Matawan Boro	3,600
Somerset - Raritan Valley Sew. Auth.	11,500
Linden - Roselle [illegible] Auth.	52,500
Jersey City (East)	180,100
Keansburg	7,500
Keyport	7,000
Bayonne	75,000
Woodbridge - Sewaren	30,000
Sayreville - Morgan	2,000
South Amboy	8,400
Edgewater	21,700
West New York Joint Meeting	50,000
Carteret	15,000
Kearny	40,000
Woodbridge - Keasby	8,000
Sayreville - Melrose	1,000
Hoboken	70,000
Laurence Harbor	8,000
	1,296,200
Connecticut	
A. Municipal	
Darien	6,300
Bridgeport Plant #1	40,000
Bridgeport Plant #2	90,000
Norwalk	55,000
	191,300
	2,264,770

TABLE III-3 (Cont'd)

Waste Source	Population Served
Code 05: Intermediate plant suitable for upgrading. Build new secondary facilities.	
New York City	
A. Municipal	
Owls Head	800,000
Rockaway	70,000
Oakwood Beach	60,000
26th Ward	316,000
Coney Island	604,000
Jamaica	582,200
	2,432,200
Code 06: Secondary plant presently overloaded but in good condition. Build new facilities to handle overload.	
New York City	
A. Municipal	
Hunts Point	770,000
Tallmans Island	400,000
	1,170,000
Code 07: Secondary plant in fair to poor condition. Continue to use if not overloaded but improve plant efficiency.	
New York City	
A. Municipal	
Wards Island	1,470,000
Bowery Bay	750,000
	2,220,000
New Jersey	
A. Municipal	
Bergen County Sewer. Auth.	300,000
	300,000
	2,520,000
Code 08: Secondary plant in fair to poor condition. Build new secondary if overloaded.	
New Jersey	
A. Municipal	
Totowa Boro (Riverview)	7,000
	7,000
TOTAL	11.767,320 a/

a/ Total of known population served.

TABLE III-4

IMMEDIATE CONSTRUCTION COSTS, INTERSTATE WATERS,
METROPOLITAN NEW YORK REGION, MUNICIPAL NEEDS THROUGH 1990
(EXCEPT NEW YORK CITY) a/

Priority b/	Number Plants			Estimated Plant Cost ($000) c/			Estimated Ancillary Work ($000) d/			Total By State ($000) a/			TOTAL a/ ($000)
	N.Y.	N.J.	Conn.	N.Y.	N.J.	Conn.	N.Y.	N.J.	Conn.	N.Y.	N.J.	Conn.	
I	1	16	-	1,100	50,800	-	900	42,300	-	2,000	93,100	-	95,100
II	9	20	5	22,000	40,100	10,200	18,300	33,100	8,500	40,300	73,200	18,700	132,200
III	11	7	-	6,300	11,600	-	5,200	9,600	-	11,500	21,200	-	32,700
	21	43	5	29,400	102,500	10,200	24,400	85,000	8,500	53,800	187,500	18,700	260,000
Construction Activity Code b/													
01	-	11	-	-	8,800	-	-	7,300	-	-	16,100	-	16,100
02	8	6	1	7,200	46,800	3,700	6,000	38,800	3,100	13,200	85,600	6,800	105,600
04	13	24	4	22,200	40,400	6,500	18,400	33,500	5,400	40,600	73,900	11,900	126,400
07	-	1	-	-	6,000	-	-	5,000	-	-	11,000	-	11,000
08	-	1	-	-	500	-	-	400	-	-	900	-	900
	21	43	5	29,400	102,500	10,200	24,400	85,000	8,500	53,800	187,500	18,700	260,000

a/ Above data does not include costs for New York City. See Table III-5 for New York City.

b/ See Table III-3 for Construction Activity Code and Appendix A for priority criteria.

c/ Estimated plant cost = (1966 population served x factor projected to year 1990) x (unit cost per capita) x (projected 1970 FWPCA construction cost index) x (factor for engineering, legal and other fees).

d/ Estimated cost for ancillary work (interceptors, outfalls and pumping stations, etc.) = (Estimated cost of plant) x (.83).

TABLE III-5

IMMEDIATE CONSTRUCTION COSTS,
INTERSTATE WATERS, METROPOLITAN
NEW YORK REGION, MUNICIPAL NEEDS,
NEW YORK CITY

Priority [a]	No. Plants	Total Cost [b] ($000)
I	9	223,530
II	6	153,900
III	8	121,500
	23	498,930

Construction Activity Code [a]		
01	11	234,830
04	2	45,000
05	6	175,700
06	2	4,000
07	2	39,400
	23	498,930

a/ See Table III-3 for Construction Activity Code and Appendix A for priority criteria.

b/ Estimated costs are based on:

1) For presently planned construction - scheduled appropriations (provided by New York City); and

2) For needed construction not presently planned - an estimated per capita cost figure was derived from City appropriations made or scheduled to date. Costs breakdown for plant and for ancillary work are not available.

TABLE III-6

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY AND CONSTRUCTION ACTIVITY
INTRASTATE WATERS, METROPOLITAN NEW YORK REGION, MUNICIPAL SOURCES
SUMMARY [a]

Priority [b]	New York		New Jersey		Connecticut		TOTAL	
	Number Plants	Pop. Served	Number Plants	Pop. Served	Number Plants	Pop. Served	Number Plants	Pop. Served
I	1	5,000	5	22,900	1	2,500	7	30,400
II	1	125	13	87,000	-	-	14	87,125
III	-	-	-	-	-	-	-	-
IV	-	-	-	-	-	-	-	-
	2	5,125	18	109,900	1	2,500	21	117,525 [d]
Construction Activity Code [c]								
01	-	-	3	12,600	-	-	3	12,600
02	2	5,125	-	-	-	-	2	5,125
04	-	-	11	77,600	1	2,500	12	80,100
05	-	-	-	-	-	-	-	-
06	-	-	2	11,700	-	-	2	11,700
07	-	-	-	-	-	-	-	-
08	-	-	2	8,000	-	-	2	8,000
	2	5,125	18	109,900	1	2,500	21	117,525 [d]

[a] See Table III-7 and III-8 for listing of individual sources.
[b] See Appendix A for priority criteria.
[c] See Table III-8 for identification of Construction Activity Code.
[d] Total of known population served.

TABLE III-7

IMMEDIATE CONSTRUCTION NEEDS BY PRIORITY, INTRASTATE WATERS,
METROPOLITAN NEW YORK REGION,
MUNICIPAL NEEDS

Waste Source	Construction Activity Code [a]	Population Served
Priority I [b]		
New York		
Briarcliff - Manor #2	02	5,000
		5,000
New Jersey		
Demarest	01	4,300
Closter	01	7,800
Alpine	01	500
Stirling - Passaic Twp.	04	1,300
Hasbrouck Hts.	04	9,000
		22,900
Connecticut		
Ridgefield	04	2,500
		2,500
		30,400
Priority II [b]		
New York		
Briarcliff - Manor #1	02	125
New Jersey		
Verona Boro	06	11,000
Essex County Inst.	04	3,900
Berkeley Hts.	04	10,000
Chatham - Madison JM	04	10,000
Cedar Grove Twp.	04	18,000
Jamesburg	08	1,500
Helmetta (Helm Prod. Co.)	06	700
Millington - Passaic Twp.	04	1,200
Livingston - Okner Pkwy.	04	1,000
Wood Ridge	08	6,500
Raritan	04	5,200
Wanaque	04	1,000
Caldwell	04	17,000
		87,000
		87,125
	TOTAL	117,525 [c]

[a] See Table III-8 for definitions of Construction Activity Code.
[b] See Appendix A for priority criteria.
[c] Total of known population served.

TABLE III-8

IMMEDIATE CONSTRUCTION NEEDS BY TYPE, INTRASTATE WATERS,
METROPOLITAN NEW YORK REGION,
MUNICIPAL NEEDS

Waste Source	Population Served
Code 01: Discharging raw sewage. Build secondary plant.	
New Jersey	
Demarest	4,300
Closter	7,800
Alpine	500
	12,600
Code 02: Not suitable for upgrading to secondary. Build new primary and upgrade to secondary.	
New York	
Briarcliff - Manor #2	5,000
Briarcliff - Manor #1	125
	5,125
Code 04: Primary plant suitable for upgrading. Build new secondary facilities.	
New Jersey	
Stirling - Passaic Twp.	1,300
Hasbrouck Hts.	9,000
Essex County Inst.	3,900
Berkeley Hts.	10,000
Chatham - Madison JM	10,000
Cedar Grove Twp.	18,000
Millington - Passaic Twp.	1,200
Livingston - Okner Pkwy.	1,000
Raritan	5,200
Wanaque	1,000
Caldwell	17,000
	77,600
Connecticut	
Ridgefield	2,500
	80,100
Code 06: Secondary plant presently overloaded but in good condition. Build new facilities to handle overload.	
New Jersey	
Verona Boro	11,000
Helmetta (Helm Prod. Co.)	700
	11,700
Code 08: Secondary plant in fair to poor condition. Build new secondary if overloaded.	
New Jersey	
Jamesburg	1,500
Wood Ridge	6,500
	8,000
TOTAL	117,525 a/

a/ Total of known population served.

TABLE III-9

IMMEDIATE CONSTRUCTION COSTS
INTRASTATE WATERS, METROPOLITAN NEW YORK REGION
MUNICIPAL NEEDS THROUGH 1990

Priority [a]	No. Plants N.Y.	N.J.	Conn.	Estimated Plant Cost ($000) [b] N.Y.	N.J.	Conn.	Estimated Cost Ancillary Work ($000) [c] N.Y.	N.J.	Conn.	Total By State ($000) N.Y.	N.J.	Conn.	TOTAL ($000)
I	1	5	1	760	2,200	220	630	1,840	180	1,390	4,060	400	5,850
II	1	13	-	70	5,250	-	60	4,360	-	130	9,610	-	9,740
	2	18	1	830	7,470	220	690	6,200	180	1,520	13,670	400	15,590

Construction Activity Code [a]													
01	-	3	-	-	1,500	-	-	1,250	-	-	2,750	-	2,750
02	2	-	-	830	-	-	690	-	-	1,520	-	-	1,520
04	-	11	1	-	4,680	220	-	3,880	180	-	8,560	400	8,960
06	-	2	-	-	720	-	-	600	-	-	1,320	-	1,320
08	-	2	-	-	570	-	-	470	-	-	1,040	-	1,040
	2	18	1	830	7,470	220	690	6,200	180	1,520	13,670	400	15,590

[a] See Table III-8 for Construction Activity Code, and Appendix A for priority criteria.

[b] Estimated plant cost = (1966 population served) x (factor projected to year 1990) x (unit cost per capita) x (projected 1970 FWPCA construction cost index) x (factor for engineering, legal and other fees).

[c] Estimated cost for ancillary work (interceptors, outfall pumping stations, etc.) = (estimated plant cost) x (.83).

TABLE III-10

DISTRIBUTION OF SELECTED INDUSTRIAL WASTE SOURCES
BY INDUSTRY, STATE AND PRIORITY
METROPOLITAN NEW YORK REGION

SIC No.	Industry	Priority of Urgency (Number of Sources) a/ NEW YORK CITY Most Urgent	Less Urgent	Least Urgent	Priority of Urgency (Number of Sources) a/ SUBURBAN NEW YORK STATE COUNTIES b/ Most Urgent	Less Urgent	Least Urgent
10	Metal Mining	-	-	1			
14	Mining, Non-Metal.	-	-	1			
16	Const., Non-Bldg.	-	-	3			
17	Const. Spec. Trade	-	-	3			
20	Food	1	2	6	3	3	9
22	Textiles	-	-	2	-	2	4
26	Paper				-	1	2
28	Chemicals	1	-	7	6	7	14
29	Petroleum Refining	-	-	25	-	-	4
30	Rubber & Plastic Products	-	-	1	-	-	2
32	Stone, Clay & Glass	-	-	10	-	1	1
33	Primary Metals	-	3	1	1	4	9
34	Fabricated Metal Products	-	-	2	-	1	2
36	Electrical Machinery	-	-	1			
37	Trans. Equipment	-	-	1	2	1	3
38	Insts. & Photo Equip.				-	2	-
39	Misc. Manufacturing	-	1	-			
40	Railroad Transport.	-	-	1			
42	Motor Freight Trans.	-	-	1			
49	Electric, Gas & Sanitary Services	-	1	-			
50	Wholesale Trade	1	-	2			
57	Retail Trade - Furn.	-	-	1			
73	Misc. Business Ser.	-	-	2			
TOTALS		3	7	71	12	22	50

See next page for footnotes.

TABLE III-10

DISTRIBUTION OF SELECTED INDUSTRIAL WASTE SOURCES
BY INDUSTRY, STATE AND PRIORITY
METROPOLITAN NEW YORK REGION (Cont'd)

SIC No.	Industry	Priority of Urgency (Number of Sources) a/ NEW JERSEY (12 COUNTIES) Most Urgent	Less Urgent	Least Urgent	Priority of Urgency (Number of Sources) a/ CONNECTICUT (FAIRFIELD COUNTY, PART) Most Urgent	Less Urgent	Least Urgent
20	Food	-	1	1			
22	Textiles				-	1	-
26	Paper	-	3	2			
27	Printing, Publishing				-	-	1
28	Chemicals	4	9	19	-	2	2
29	Petroleum Refining	1	3	1			
30	Rubber & Plastic Products				-	-	1
32	Stone, Clay & Glass	-	3	2			
33	Primary Metals	1	2	2	-	1	2
34	Fabricated Metal Products	-	-	3	-	-	2
35	Machinery, Except Electrical	-	-	3	-	1	5
36	Electrical Machinery	-	-	6	-	1	7
37	Trans. Equipment	-	-	3	-	-	2
38	Insts. & Photo Equip.	-	1	1			
39	Misc. Manufacturing	-	-	3	-	-	1
42	Motor Freight Trans.	-	-	3			
49	Electric, Gas & Sanitary Services	-	1	-			
73	Misc. Business Ser.	-	-	3			
93	Local Government	-	1	-			
TOTALS		6	24	52	-	6	23

a/ The names and addresses of industrial sources summarized in this table are on file in this agency (HCMC).

b/ Westchester, Rockland, Putnam, Orange and Dutchess.

IV - OTHER MANAGEMENT AND RESEARCH NEEDS

STREAM SURVEILLANCE PROGRAMS

To effectively accomplish the objectives of a water quality management program designed to protect and enhance prime water usages as formulated by State authorities, it is necessary that adequate stream surveillance programs be established. Such programs should include a network of manual and automated sampling stations which permit the collection, evaluation and dissemination of water quality data, so as to present a clear picture of conditions in any section of the Metropolitan New York Region. These monitoring stations should be strategically situated near major wastewater sources so as to alert pollution control authorities to irresponsible or accidental discharge of harmful material. Hence, appropriate corrective actions can be taken immediately.

The Interstate Sanitation Commission maintains two surveillance monitoring stations in the New York Harbor complex. One station is located in the Arthur Kill and the other in the East River. Data from these stations are relayed by a telemeter system to the main office where they are recorded on strip charts for review and analysis.

A surveillance program for New York State waters was established by the New York State Health Department in 1962. Since its inception, and aided by the Pure Waters Program funds made available in 1966, the New York program has developed an elaborate network of manual and automated sampling stations.

New Jersey has established a network of 200 stream quality stations, most of which are located on fresh water streams. These stations are sampled regularly four times a year. An expansion of the network, particularly in tidal waters and the installation of automated monitoring equipment, would greatly enhance the State's stream surveillance program.

STORAGE AND STREAM FLOW REGULATION

Many parts of the Metropolitan New York Region have been affected by the unusually low rainfall and runoff during recent years. The occurrence of such emergency drought conditions and the anticipated municipal and industrial water supply demand indicate the need for water storage development and streamflow regulation of many of the rivers in the Region. Comprehensive basin-wide studies will be needed to establish sound plans designed to permit a balance between all beneficial water usage. Such studies should determine the minimum flows required for the downstream control of bacterial and organic pollutants remaining after optimum treatment of waste discharges.

OPERATION AND MAINTENANCE

An adequate program of operation and maintenance at waste treatment plants is necessary to ensure that the existing and recommended new municipal treatment facilities will be effective in maintaining adequate water quality.

Adequate operation of treatment plants requires qualified resident personnel, proper laboratory control, and accurate record keeping. State, interstate and Federal agencies must provide programs aimed at ensuring these three factors are included at each plant.

New Jersey has legislation requiring that licensed personnel operate and maintain all sewage treatment facilities in the State. Because of the limited number of qualified personnel in the field, these requirements are difficult to meet. In many cases, licensed operators are responsible for more than one treatment facility. Their surveillance at each facility is limited and effective operational control is often minimized. There is an urgent need for both advanced and elementary training programs in treatment plant operation.

The State has launched new training programs to be offered at various State and County colleges. These programs are aimed at making available to those interested in water pollution control and who wish to enter the field as licensed operators, a basic course in wastewater treatment. Many advanced courses designed to broaden the knowledge of experienced operators and provide background and understanding of the new technological advances in the field will also be presented.

Federal grants to aid the states in meeting their responsibility for the training of qualified personnel should be considered. Federally sponsored and conducted training programs should also be established to assist in the training of personnel.

In order to ensure the successful implementation of any operation and maintenance program, the states must have a sufficient number of trained inspectors to periodically visit plants to review operation and laboratory control methods, and to provide technical assistance to plant personnel.

In recent years, New York State has taken positive action to upgrade plant performance by improving operation and maintenance. Legislation enacted in 1964 established a fund which provides for the payment to municipalities of one-third the cost of operation and maintenance of adequate treatment plants. To qualify, municipalities must have standard operating reports which show performance and laboratory test data, a qualified operator in charge of the plant and the collection and conveyance system must minimize the amount of untreated waste discharged.

SPECIAL STUDIES AND SURVEYS

Municipal and Industrial Waste Inventory

A review of the available data on location, volumes and characteristics of existing municipal and industrial waste discharges within the Region indicates the need for more adequate information. The information contained in this report should be validated, in many cases requiring field surveys. In addition, once an adequate base inventory has been established, there is a need to keep current the data. The states should develop adequate records providing the latest information on all waste loads for use in planning and determination of further pollution abatement needs.

Septic Tank Survey

Within the Metropolitan New York Region there are an estimated 1,100,000 persons who dispose of domestic wastes by individual septic tanks or cesspools. There are no adequate data indicating the pollution effects of such systems. A survey should be conducted to determine the following:

1. Location of those areas with large numbers of septic tank systems.

2. Determination of the effects such systems have on surface and groundwater.

3. A plan for eliminating individual disposal systems by connection to existing or new municipal collection systems. Planning of such systems should be based on regional, inter-county and inter-municipal areas.

While the first two items could be accomplished by the Federal Water Pollution Control Administration in cooperation with State and Federal agencies, the third item is the responsibility of State and local government. Existing Federal grant programs could be used to accelerate the planning, design, and construction of such regional collection systems.

Thermal Pollution

With the growth in thermonuclear power plants and continuing increase in industrial cooling water usage, pollution of these waters by heat may become a critical problem. All existing sources of thermal pollution should be identified and determinations made of their effects on the aquatic environment. Plans for new facilities should include provision for cooling towers or other means to prevent discharge of heated wastes.

Stormwater Overflow and Urban Runoff

Within the Metropolitan New York Region there are 31 municipal sewerage systems that have, at least in part, combined storm and sanitary sewage collection. There is a need to accurately determine the quality and quantity of overflows from such systems, the extent to which such overflows degrade water quality, and similarly, the magnitude and effects of direct urban runoff on the receiving waters.

Boat Pollution

There is a need to determine the magnitude of the problem associated with the discharge of litter, sewage, and oil from the large numbers of watercraft in the Region. Investigations should include research to develop practical means of controlling this source, surveys to determine the need for adequate disposal facilities at marinas, and a determination of adequate legislation to control such pollution. The State of New York has recently enacted and implemented legislation governing the discharge of wastes from vessels. New Jersey also has specific legislation regarding the discharge of wastes from watercraft.

These regulations, however, must be revised to include tidal waters, and require shore line facilities. Assuming the development of adequate legislation and satisfactory control devices, there will be a need for extensive enforcement activity throughout the waters of the Region to ensure control of this source.

Agricultural Runoff

There are no data available to indicate the extent of water pollution attributable to agricultural runoff. Since runoff from cultivated fields may convey fertilizers, herbicides and pesticides to the receiving waters, the potential dangers of such pollution require a thorough investigation. Such a study should include a determination of the types and amounts of agricultural chemicals being used, analytical data to measure the concentration of these chemicals in the receiving streams, and research into allowable concentrations and adequate control measures.

Water Quality Studies

The data included in Section VI indicate the extent to which existing water quality data are inadequate. Necessary field and laboratory sampling and analyses must be conducted to provide adequate data on existing water quality. Such information will not only confirm suspected problem areas and locate those areas with problems as yet unknown, but will establish a base against which future changes in water quality can be measured.

Dredging

Since extensive dredging activities are carried out in the Metropolitan New York Region, particularly in the Hudson River, Raritan Bay, and New York Harbor, studies should be made to determine the extent to which such operations are affecting water quality. These investigations should result in the formation of plans which will help coordinate dredging activities with water resource management, and provide guidelines and practices to be followed during dredging operations.

Bottom Deposits

The extent to which banks of sludge and other substances have accumulated and are affecting the waters of the Region is not well known. A combined laboratory and field study is needed to determine the depth and rate of sludge buildup and the oxygen-uptake rate. The effects of toxic substances and/or oil buildup on the waters, oxygen resources and organisms should also be determined.

Sanitary Landfills

There is a need to study and evaluate sanitary landfill operations throughout the Metropolitan New York Region. These investigations should determine the number and location of all landfill operations and the extent to which such areas are affecting water quality. The increasing amount of solid waste associated with the Region's growing population must also be considered in the study.

Ocean Disposal

There is a need to determine to what extent the disposal of acid waste and sewage sludge are affecting the waters of the New York Bight. A comprehensive evaluation of all aspects of the problem is required. Such a study should determine the general oceanography of the area, the effect of pollution on shallow inshore fish production, the migratory habits of fish in the area, and the extent of sludge buildup on the ocean floor and its effect on the ecology of the area. In addition, the study should determine the effect on marine life of dumping cellar dirt and dredged spoil material and the importance of river-borne wastes flowing into the Bight waters. There is an increasing demand for ocean disposal of a variety of wastes, including radioactive materials, and their cumulative effects on fishing and other legitimate water uses must also be considered as part of any study in the Region.

Aquatic Plants and Nutrients

Certain areas within the Metropolitan New York Region are plagued by dense growths of aquatic weeds and algae to the extent that interference with beneficial water use results. There is a need for a survey to determine the extent and location of such plant growths, the determination of contributing causes and the development of programs to control the problem. Such control programs should include reduction in the quantities of nutrient materials discharged to the waters as well as means of physical removal of dense plant growths.

Advanced Waste Treatment

Greater emphasis should be placed on the application of advanced waste treatment techniques, particularly in those areas where the receiving waters have insufficient assimilative capacity to handle the effluent of secondary waste treatment facilities. The application of such advanced treatment techniques should be considered for both municipal and industrial wastes.

Hydrodynamic Studies

Due to the complexity of the New York Harbor Area there is a lack of knowledge of such factors as currents, dispersion of pollutants, and stratification. Although some studies have been or are being made by the State of New York and the Federal Water Pollution Control Administration, there is a need for better coordination of existing studies and a more comprehensive approach to obtain an adequate understanding of the problems associated with an estuary such as the New York Harbor. There is a need to develop a three-dimensional, time variable mathematical model which will allow water pollution agencies to predict more accurately the quality of the water under these complex geophysical conditions.

Data Systems

With the increasing tempo of data collection by a number of agencies at all levels of government, there is a need for an integrated system of handling water quality and water use data within the Region. Such a system, which

might be based on the existing Federal Water Pollution Control Administration STORET program, would make possible better interchange of knowledge and eliminate duplication of studies. Such an integrated system would also be of value in permitting the application of such techniques as mathematical modelling and systems analysis in the development of overall water quality management programs.

Regional Cooperation

A review of water quality problems and water needs within the Metropolitan New York Region points out the interrelationship throughout the entire Region. There is a need for closer coordination in water quality management to ensure that on-going and future programs consider not only the immediate locality but also the effects upon the Region as a whole. Studies recommending the creation of regional authorities must ensure that the needs of the smaller river basins are represented, weighed and/or integrated into the regional water management programs.

Legal Framework

To ensure that adequate water pollution control programs can be formulated and implemented, there is a need to evaluate existing legal mechanisms and institutional arrangements to determine their adequacy to deal with water quality problems on both a local and a regional basis. At the present time there is a lack of data on the adequacy of existing framework, as well as a lack of information on the interrelationships between various authorities and governmental agencies in dealing with the problem of resource management. In a number of localities there is a requirement for additional legislation to zone present and future shoreline developments.

Financial Arrangements

Investigations must be carried out to determine the amount of financial participation each basin entity (government and private) should produce to meet expenditures required for immediate and long range pollution control programs. The role of Federal, State, local and private bodies must be evaluated in terms of cost and benefits to give an indication of the economic impact of water pollution control programs and their effects upon the Region as a whole. Such problems as competition between various public works programs such as highways, education, and water pollution control must be evaluated to ensure that programs aimed at achieving water quality management receive a proportionate share of total public and private expenditures.

Miscellaneous Studies

In addition to the outline of studies listed above there is a need to survey a variety of other existing pollutional sources and potential problem areas including oil pollution sources.

V - RECENT PROGRESS IN POLLUTION CONTROL

INTERSTATE ACTION

The Interstate Sanitation Commission, a regulatory pollution agency for the metropolitan area, was created by a compact between the States of New York, New Jersey and Connecticut for the abatement of existing pollution and the control of any potential wastewater problems in coastal and tidal waters of the New York Metropolitan Region, and other areas east of the Region in parts of Long Island and Connecticut. The Commission has the power to make rules, regulations and issue orders with regard to pollution and to determine the adequacy of treatment provided by wastewater facilities. It carries on a program of surveillance and when necessary can resort to the courts to compel enforcement. The Commission endeavors to convince municipalities and industries of the need for voluntary and cooperative abatement measures before it considers enforcement action.

Thirty-three projects were completed in the past two years. These represented an expenditure of $115,736,837. By far the most important are four projects in New York City: completion of the Newtown Creek Project in 1966 ($48,781,900), extension program at the Jamaica Bay Project ($18,653,000), the interception of all raw waste discharges in the Riverdale section of Bronx County into the Wards Island Pollution Control Project Plant ($10,000,000), and additions and modifications at the Hunts Point Project in 1965 ($7,655,000).

In addition, there are twenty-two projects actively undergoing alteration. The most important are in New York City. These entail modernization, extension, reconstruction and expansion at the following Project sites: Coney Island, Owls Head, Oakwood Beach, Port Richmond, and Red Hook. Plans for the construction of Manhattan's North River waste plant are underway.

Urgent future projects in the Jamaica Bay, Eastchester Bay, and Upper East River area involve the problem of combined sewers. Here combined sewer treatment plants cannot hold excess flows during storm periods. Combined overflow treatment basins are under consideration. These will receive the excess flow and provide sedimentation, skimming and disinfection before discharging to the receiving waters.

NEW JERSEY

Although the State of New Jersey has strong statutes relating to water pollution control and has had them tested and upheld in the highest State courts, their implementation has not kept pace with the problems. Generally, State enforcement has been weak and selective.

During 1966 the Governor's office undertook a comprehensive review and evaluation of the State's administration of water pollution control programs. In a recent message to the legislature, the Governor proposed a greatly expanded management program that calls for a marked increase in personnel and requests higher compensation, in order that competent people will be attracted to State service.

Highlighted below are several practical measures that have been taken to broaden the State's role in water pollution control.

The State of New Jersey has established a stream classification program. In August 1964, the Department of Health promulgated formal rules and regulations, including water quality criteria, establishing classifications to be assigned to the waters of the State. These rules and regulations constitute the basis for classification of the various individual watersheds. The classifications are administrative tools designed to augment the existing statutes.

Classifications for each river basin are proposed by the Department based on recommendations made by an inter-departmental committee established by the Department and the State Department of Conservation and Economic Development. Following public hearings, formal classifications will be issued for each major watershed in the Region.

After classification, the Department promulgates regulations specifying the minimum degree of treatment required to comply with the classifications and issues appropriate orders against violators.

During late 1966 the State moved swiftly to implement these regulations. Early in 1967 seven municipalities, four industries and one institution were ordered to treat their effluents before discharge, directly or indirectly, into the Passaic River. In May 1967 five industrial operations in Linden and Woodbridge had been ordered to take steps to abate pollution into the Arthur Kill. In June six municipalities and two sewerage authorities were ordered to reduce the amount of pollution they discharge into the Raritan and Sandy Hook Bays and the Arthur Kill. Each order schedules deadline periods of construction activity to be completed by 1970. Several have been ordered to complete corrective construction even sooner. These measures demonstrate that the State is intensifying its efforts to abate and control water pollution in the Region.

The State Public Sanitary Sewerage Facilities Act of 1965 authorizes the Commissioner of Health to make grants and loans to local governmental units for the preparation of feasibility studies on the engineering design of public sanitary sewerage facilities. The law declares that it is the public policy of the State, "to encourage and support, as hereinafter provided, the promotion, planning, development and construction of public sanitary sewerage facilities, including collection, transmission, treatment and disposal works on a regional or multi-unit basis."

Grants are authorized for the purpose of preparing feasibility studies and reports on projects for the collection, treatment and disposal of sewage involving two or more local governmental units, acting together on a joint basis.

Loans are authorized for the preparation of preliminary engineering plans, detail design, engineering drawings and specifications, and contract documents for the construction of a new, or expansion of an existing, sewerage facility provided a feasibility study or a report upon the facility has been filed with and approved by the Commissioner.

This act became effective July 1, 1965 with $1,000,000 appropriated for carrying out the grant and loan provisions. An additional $4,000,000 was appropriated for Fiscal Year 1967.

The County Sewerage Financing Law (Chapter 205) passed in 1966, permits counties, separately or jointly with municipalities located within the county (1) to construct or acquire sewage disposal facilities or sanitary sewers, (2) to operate such facilities, and (3) to furnish the services of these facilities to any municipality within the county.

The law also authorizes a county (1) to issue general obligation bonds to finance the construction or acquisition of such facilities, (2) to fix and collect fees for the facilities and services furnished, (3) to accept grants and gifts, and (4) to enter into contracts and carry out other business necessary to the operation of these facilities.

This law is designed to supplement the "Sewerage Authorities Law." It specifically restricts a county from establishing any sewage disposal system, however, that would be competitive with a county sewerage or municipal utilities authority previously established under existing legislation, without the consent of such existing authority.

NEW YORK

In 1965 the State of New York completed a comprehensive survey of its pollution abatement needs. This survey showed that more than 100 municipalities provided no treatment, and an additional 43 communities provided inadequate treatment. This survey also indicated that the most important pollution control challenge in New York State is the need for control of industrial wastes.

In August 1965, the State Health Department adopted new treatment requirements which prescribe minimum treatment levels for each class of water. The policy also requires that wastes must be treated on the basis of the highest downstream classification and not merely the classification of the immediate receiving water. Under this policy treated wastes must meet the following requirements:

Classification	Minimum Required Treatment
AA	Tertiary treatment and chlorination.
A & B	Secondary treatment and chlorination.
C	Secondary treatment.
D	Primary treatment. Secondary treatment where these waters adversely affect downstream waters of higher classification.

In November of 1965 New York State enacted a Pure Waters Act with an accompanying 1.7 billion dollar program for water pollution control.

The principal features of this Act included:

1. A one billion dollar fund to pre-finance Federal construction grant money so as to make possible total State and Federal grants of 60% of the cost of treatment plants, outfalls and interceptors.

2. Tax incentives to increase pollution control activities by industry.

3. Payment of one-third of the operation and maintenance costs of municipal plants providing adequate treatment.

4. Establishment of an automated water quality monitoring network throughout the State.

5. Provision for accelerated enforcement procedures.

6. Establishment of a program to control waste discharges from State installations.

7. Promotion of basic and applied research.

During the 1966 legislative session the State passed additional statutes to further the water pollution control program. These new laws included the following provisions:

1. Municipalities under orders by the State Health Department are denied the right of referendum on bond issues for the construction of treatment facilities.

2. Cities are permitted to anticipate future waste control needs in the purchase of land and in the construction of treatment plants, to provide capacity for future growth.

3. Bacteriological standards were set for waters used for potable water supply and bathing and for streams that traverse urbanized areas. This statute requires higher treatment efficiencies when coliform counts in the receiving water reach specified maxima.

4. Local authorities were given enforcement power to abate wastes from individual homes and small businesses.

5. Regulations were established to control pollutional discharges from boating.

6. Both municipalities and industries must maintain records on the quantity and quality of waste discharges and must make these records available to the Commissioner of Health. This law also prohibited the use of any existing or new outlet for waste discharge unless such use complies with all rules and regulations of the State Health Department.

7. An authorization for injunctive action when a violation of water pollution control law occurs.

8. Local financing laws were liberalized to encourage greater local initiative in construction of waste treatment facilities.

New York State is having a mathematical model made to describe water quality of the Hudson River from Glens Falls to the Battery.

CONNECTICUT

Action taken by the State of Connecticut is covered in the Immediate Needs Report for the Southern New England Action Area prepared by the New England River Basin Comprehensive Program.

FEDERAL

Federal Water Pollution Control Administration personnel and resources have been employed to investigate and abate pollution in the New York Harbor Region. In addition to the activity of the construction grants program, a number of laboratory and field studies have been carried out. In 1966 the Federal Water Pollution Control Administration completed reports entitled "Water Quality Control Study" on the Raritan River Basin and the Passaic River Basin for the U. S. Army Corps of Engineers. These reports examined the existing waterways and reviewed the effects of proposed projects involving dams and/or channel improvements. The reports covered water quality effects as related to present and future water needs.

In September 1965 a report was issued in conjunction with a conference held on "Pollution of the Hudson River and its Tributaries." The report described the pollution problem in the Region and recommended remedial action. At the request of the governors of New York and New Jersey, the FWPCA called a conference on the matter of pollution of the interstate waters of the Hudson River below Troy. The Interstate Sanitation Commission also participated in this conference. Appendix D contains the conclusions and recommendations of this conference held September 28-30, 1965. A conference will be held in September 1967 to review the progress and adopt further recommendations to achieve the desired results.

In May 1967 the Raritan Bay Project of the Federal Water Pollution Control Administration issued a report on "Pollution of Raritan Bay and Adjacent Waters" in anticipation of an enforcement conference to be held in New York City. The conference took place in June 1967 and its participants recommended elimination of pollution in Raritan Bay. The conclusions and recommendations of this conference are contained in Appendix E.

VI - BACKGROUND FOR RECOMMENDATIONS

KNOWN WATER QUALITY PROBLEMS

To determine the extent that municipal, industrial and other waste discharges have affected the quality and use of the Metropolitan New York Region waters, an evaluation was made, based on existing data from limited Project field surveys, State reports and records, and the New England-New York Inter-Agency Committee Report. Analytical data were compared with parameter values regarded as acceptable for such water uses as water supply, recreational bathing and boating, and sport fishing. The following streams and water bodies, arranged by river basin, were found to have water quality below that required for the expected water uses. Specific problems and those areas requiring further study are also indicated.

Lower Hudson River Basin

The Lower Hudson River can be categorically described as being extremely polluted. Federal Water Pollution Control Administration data indicate that the average coliform density level from the George Washington Bridge to the Battery ranges between 6,000 and 40,000/100 ml, depending upon the tidal phase. A total of 20 municipal treatment plants are discharging raw or inadequately treated wastes into this stretch of the Hudson River. The discharge of raw sewage from Manhattan is the largest municipal contributor of pollution in this Region. Many industrial discharges are also considered as major pollutional sources. The discharges from combined sewer systems, recreational and commercial boating and the complex hydrographic conditions in New York Harbor may also be contributing to water quality degradation of the Basin's waters. Additional study in this area is required.

Croton River Basin

In general, water in the Croton River is of good quality and is used by the City of New York as a water supply source. Six municipal sewage treatment plants are discharging their wastes into the stream causing localized pollution problems. In populated areas the waters suffer some degradation, and New York City has had to provide stream chlorination stations to protect its watershed.

Other Streams

There are several streams in the Lower Hudson River Basin which receive the discharges from municipal and industrial waste sources. These streams are Sparkill Creek, Annsville Creek, Furnace Brook, Pocantico River and Minisceongo Creek. There is limited evidence tc indicate that these streams are being adversely affected by these discharges. Additional investigation in this area is needed.

Hackensack River Basin

Hackensack River

Water quality in the Upper Hackensack River, above Oradell Dam, is of a quality suitable for municipal water supply after complete treatment. Below Oradell Dam the quality of the River deteriorates and indicates severe pollution at its confluence with Newark Bay. The discharges of 11 municipal and several industrial waste sources are the major causes of water quality degradation. Other suspected sources of pollution are those entering the river from Newark Bay during flood tide and from polluted tributary streams. The "hot" cooling discharges from an existing steam generating plant, recreational and commercial boating and other unknown waste sources may also be contributing to the poor water quality of the River. Additional study in these areas is needed.

Pascack Brook

Available data indicate this stream is of poor water quality. High coliform density levels have been recorded and pollution tolerant species observed throughout many sections of the Brook. Six municipal sewage systems, five of which discharge wastes raw, are the major sources of pollution on this brook. A major tributary, Muddy Creek, which is also of poor quality, may be causing water quality degradation. Septic tank seepage may also be affecting water quality. Additional investigation is required to delineate the total effect of these sources on the brook.

Tenakill Brook and Demarest Brook

Both of these streams, Tenakill Brook and its tributary Demarest Brook, have serious pollution problems. The raw discharges from the towns of Alpine (into Demarest Brook) and Demarest (into Tenakill Brook) are believed to be the major sources of pollution. Septic tank seepage is also suspected of contributing to poor water quality of these small streams.

Bellmans, Cromakill and Mill Creeks

These small tributaries located in the tidal portion of the Hackensack River are of poor water quality. Each stream receives the discharge from one municipal treatment facility. The pollution effect of the Hackensack during tidal action may also contribute to the water quality degradation of these streams. Additional investigation to accurately determine to what extent the municipal discharges are affecting these waters is required.

Berry Creek

The waters of Berry Creek are of poor water quality. The major causes of pollution are the municipal treatment plant discharges of Rutherford, Woodridge and Hasbrouck Heights and two industrial discharges. Additional study to determine the extent to which industrial discharges are causing water quality degradation is needed.

Passaic River Basin

Passaic River

The waters of the Passaic River are being adversely affected by the discharges from eight municipal waste treatment systems and nine known industries. Water quality, particularly below the confluence of the Whippany River, is characterized by high BOD, low dissolved oxygen and high coliform concentrations. The tidal portion, below Dundee Dam, is another section of very poor water quality. Here the river is adversely affected by the waters of Newark Bay and other tributary streams including the Saddle River. Sludge deposits are building up on the bottom. Additional study in these areas is needed.

Greenwood Lake

In general, the water quality of Greenwood Lake is considered good. Septic tanks from the many vacation cabins surrounding the lake and the waste discharges from recreational boating activities may be affecting water quality. Additional investigations in these areas are needed.

Ramapo River and Tributaries

The waters of the Ramapo River and its tributaries are being adversely affected by domestic and industrial discharges. Three municipal sewage treatment plants at Suffern, Tuxedo and Tuxedo Park are suspected of contributing to the poor condition of these waters. Septic tank seepage and industrial waste discharges may also be affecting water quality. Additional study is required to delineate the effect each of these sources has on water quality of these waters.

Rockaway River

Water quality problems, particularly during the summer months, have occurred in the Rockaway River downstream of the water supply reservoir at Boonton. Critical flow conditions caused by the water impoundment and the discharges from two municipal treatment plants may be causing the degradation of these waters.

Whippany River

Two municipalities and ten industries are known to be discharging into the Whippany River. These discharges have resulted in high BOD concentrations, low dissolved oxygen levels and high coliform densities. High color and turbidity concentrations have also been recorded. The Whippany Paperboard Company is a major contributor of organic material being discharged into this River.

Pompton River

Limited available data indicate that water quality of the Pompton River is generally good. The discharges, from one municipal primary treatment facility, that do not receive disinfection prior to release may contribute to

some localized problems. Industrial wastewater discharges may also be affecting these waters. Additional study is required.

Pequannock and Wanaque Rivers

The waters of the Pequannock and Wanaque Rivers are generally accepted as of good water quality. These waters are used extensively for municipal and industrial water supply purposes. The municipal facility discharging into the waters of the Pequannock provides secondary treatment but there are no data available to evaluate its effect.

Packanack Creek

There are no data available to indicate to what extent the discharge from the Wayne Township secondary treatment facility is affecting Packanack Creek. Additional study is required.

Singac Brook

Singac Brook receives the waste discharges from one municipal treatment plant and one known industrial facility. Additional study is needed before the extent to which these wastes are affecting the water quality of Singac Brook can be determined.

Peckman River

The Peckman River receives the discharges from three municipal secondary treatment plants (Verona, Cedar Grove and Little Falls) and the Essex County Institution primary facility. Further studies are needed to determine the effects on water quality.

Saddle River

There is evidence that the water quality of the Saddle River is poor. Two municipal treatment plants are known to be discharging into it. Floating trash and other solid materials have been observed in the stream. Additional survey work must be performed to determine the pollutional effects of the municipal facilities and identify the source of the floating materials.

Raritan River Basin

Raritan River

Waste discharges from seven municipal and at least eight industrial facilities are seriously degrading the water quality of the Raritan River. Dissolved oxygen levels of zero are often recorded. Also suspected of contributing to water quality degradation are the tidal contribution from Raritan Bay combined sewer overflows, leaching from oil storage facilities, storm drains, and "hot" cooling water discharges. These areas need further study.

South Branch

South Branch is receiving the waste discharges of one municipal and several industrial facilities. There may be other unknown waste sources which may also be contributing to the degradation of these waters.

Millstone River

Wastes from four municipal and at least one industrial facility create a serious pollution problem requiring further study. Septic tank seepage and agricultural runoff may also be a contributing factor to the pollution of these waters.

East River Basin

Long Island Sound (New York State)

The upper portion of the East River and the western extremity of Long Island Sound receive the wastes of nine municipal treatment plants and many industrial operations. Because of high observed coliform densities, bathing has been restricted. In addition, dissolved oxygen levels less than 3 mg/l have been frequently observed. Combined sewer outfalls, recreational and commercial boating, hydrographic conditions and bottom deposits also contribute to water quality degradation.

East River

Vast quantities of bottom sludge, low dissolved oxygen and high coliform levels, odor and unsightly appearance characterize this part of the river. Untreated sewage from Manhattan and Brooklyn are major pollutional sources. Recreational and commercial boating and combined sewer outfalls are also affecting these waters.

Upper New York Harbor to Narrows

Upper New York Bay

Untreated sewage is being discharged into Upper New York Bay from Manhattan, Brooklyn and Staten Island. The inadequately treated wastes of the Passaic Valley Sewerage Commission are also released to these waters. As a result, low dissolved oxygen and high coliform counts are recorded. The Upper Bay is a major source of pollution to other waters of the New York Harbor Complex. Also suspected of contributing to the extreme poor quality of these waters are recreational and commercial boating, dredging activities, combined sewer overflows, and hydrographic conditions. Additional study to determine the extent these areas are affecting the Upper Bay is needed.

Kill van Kull

The waters of Kill van Kull are characterized by coliform densities which regularly exceed 20,000/100 ml and dissolved oxygen levels often below 2 mg/l.

Municipal and industrial discharges from the Bayonne area and Staten Island are the major pollutional sources.

Lower New York Harbor

Lower New York Bay

The waters of the Lower Bay are degraded. Five municipal sewage plants discharge into these waters. However, the primary cause of pollution is the transfer of untreated and inadequately treated wastes from Upper Bay through the Narrows.

Jamaica Bay and Rockaway Inlet

Jamaica Bay and Rockaway Inlet receive the waste discharges from six municipal treatment plants operated by New York City. There is a serious problem of degradation of these waters and their recreational value is seriously compromised by this pollution. Recreational boating, dredging activities, sludge disposal practices and combined sewer outfalls are also suspected of contributing to the poor water quality of these waters. Additional studies are needed in these areas.

Raritan Bay Area

Raritan Bay

Discharges from eleven municipalities are a major cause of water quality degradation of these waters. The movement of water from the Upper Bay and the Raritan River are other causes of pollution. Bacteria densities along bathing areas of Staten Island are markedly above minimum health standards. Additional pollution of these waters results from recreational and commercial boating, dredging activities, stormwater overflows and discharges of "hot" cooling waters. All of the productive shellfish harvest areas of Raritan Bay have been closed by the adjacent states.

Sandy Hook Bay

Although the only approved shellfish harvest area in the Region is found in Sandy Hook Bay, most of the Bay has been closed to shellfish harvesting because of high bacterial counts. The major sources of pollution are one outdated and overloaded municipal treatment plant and one Federal facility.

Matawan Creek

Matawan Creek receives the discharges of two municipalities. Additional surveys are necessary to determine to what extent, if any, these waste sources are affecting the water quality of these waters.

Arthur Kill Area

Arthur Kill

The Arthur Kill may be the most severely polluted body of water in the Nation. A comparatively narrow strait, the Arthur Kill is polluted by the discharge of raw or inadequately treated industrial and municipal wastes. At least 17 industrial facilities and six municipal sewage treatment plants discharge directly into the Kill. These impose an oxygen demand far exceeding its assimilative capacity. Sample data indicate the Kill is devoid of benthic organisms. This may be due to the buildup of oil deposits and toxic materials on the floor of the strait. Additional studies in these areas are needed.

Rahway River

The waters of the Rahway River are degraded by its proximity to Arthur Kill and several discharges from several industrial firms along its banks.

Woodbridge Creek

The major sources of pollution to Woodbridge Creek are the waste discharges, after some treatment, of the American Cyanamid Company and Chevron Oil Company. The influx of pollutional material from tidal waters of the Arthur Kill also contribute waste to these waters. Additional studies are needed.

Bridge Creek

A major industrial waste source and the intrusion of the Arthur Kill are major sources of pollution to this Creek.

Connecticut Basin

Long Island Sound (Connecticut)

At least ten municipal plants and 83 industrial facilities discharge into the Sound between the New York line and the edge of the Housatonic River Basin. Further study is required to determine the type and extent of degradation present in this part of the Sound.

Byram River

Available data indicate pollution from one municipal and two industrial wastewater discharges. However, further investigation must be performed to determine to what extent the Byram River is degraded from these sources.

Other Rivers

Municipal and/or industrial waste sources are discharging wastes into seven streams in this basin. These streams are: Mianus River, Noroton River, Five Mile River, Norwalk River, Saugatuck River and Poquonock River. Field

surveys must be accomplished to develop adequate data to determine water quality and the effect of these pollutants.

STREAM CATEGORIZATION

To highlight the extent of existing information on present water quality of the various streams, inlets and bays within the Region, a system of categorization was used to summarize existing data. This system assigns to each water body one or more of the following categories:

Category I - No water quality problems;
Category II - Water quality problems are known and solutions readily identified;
Category III - Water quality problems are indicated by available data, but causes and/or solutions are unknown;
Category IV - Insufficient data to indicate presence or absence of problems.

The categories assigned to the receiving waters, as shown in Table VI-1, point out that little or no information is available as to the extent of pollution other than that from certain municipal and industrial waste discharges. Where available data indicate a need for increased treatment at existing plants, or for construction of new facilities, a Category II was assigned. In many cases, however, lack of information on other sources of pollution, or the seriousness of the problem, resulted in the additional assignment of Category III and/or IV.

Table VI-1 also indicates suspected sources and problems for the various streams. These data, which are based on limited analytical work, combined with knowledge of the particular water body, indicate a need for further studies to determine the extent and control of such pollutional problems as:

1. Combined Stormwater Runoff
2. Bottom Deposits
3. Dredging
4. Sanitary Landfill
5. Ocean Disposal
6. Septic Tanks and Cesspools
7. Eutrophication and Aquatic Vegetation
8. Boat Pollution
9. Thermal Pollution
10. Hydrodynamic Considerations.

Since the categories have been assigned on the basis of present knowledge and conditions, continued surveillance should be undertaken to permit identification of new problems as they arise.

MUNICIPAL, INSTITUTIONAL & FEDERAL POLLUTION SOURCES

Data have been collected for 161 municipal and institutional waste sources and for 75 Federal waste systems that discharge into the inter- and intrastate waters of the Metropolitan New York Region, an area which comprises the greater portion of the New York City Metropolitan complex. These plants serve an estimated 13,445,000 persons, of which about 8,400,000 persons are in New York City, 3,800,000 in northern and central New Jersey, and 850,000 persons in the area adjacent to the Hudson River between Peekskill and New York City and in the area of Port Chester and Mamaroneck. Nassau and Suffolk Counties on Long Island, sometimes considered as part of Metropolitan New York, are discussed in another report.

Thirty-three of the municipal and Federal facilities identified discharge into the Lower Hudson and its tributaries, 30 discharge into the Hackensack Drainage Basin, 27 into the Passaic River Basin, 15 into the Connecticut Coastal Basin, and 12 into the waters of the Raritan River and its tributaries. Discharging into the New York Harbor Complex are a total of 56 systems. Federal installations are scattered throughout the Region, with the majority discharging into city sewers. Due to the scarcity of available information, no accurate figures can be provided regarding the total number of industrial waste sources in the Region, but it is estimated that there may be several thousand (See Section III). Of the 236 municipal and Federal systems, 54 municipal and institutional and 69 Federal facilities provide satisfactory waste water treatment. The remaining 113 facilities provide no treatment or inadequate treatment.

A summary of the information regarding all known waste sources is outlined in Table VI-2. Data for this table were obtained from Project reports and records and the FWPCA Municipal Waste Inventory of 1962. Included in Table VI-2 are all the facilities that discharge into interstate waters, which are defined as water bodies that cross or form international or state boundaries and the tidal portions of rivers and streams flowing into coastal waters. Also included are those facilities located on intrastate waters that adversely affect the quality of interstate waters. Table VI-2 also lists those treatment facilities located on intrastate waters. Intrastate waters are defined as those rivers, streams and lakes situated entirely within a state and not adjacent to state boundaries.

Municipal & Institutional Waste Discharges

There are 122 municipal and institutional waste sources discharging into or affecting the Region's interstate waters. They handle a total waste load of approximately 13 million persons. Fifty-seven plants serving over nine million persons are located in New York State. Of these 57, 17 accounting for nearly eight and one-half million persons are in New York City. Fifty-one other systems serving more than three and one-half million persons are in New Jersey and 14 plants handling the wastes of about 340,000 persons are in Connecticut.

There are 39 systems serving over 270,000 persons discharging wastes into the intrastate waters of the Metropolitan New York Region. Thirty plants serving approximately 92 percent of the total intrastate load are located in New Jersey. Eight other plants are located in New York and one in Connecticut.

Federal Waste Discharges

On the basis of information compiled by the Department of Health, Education, and Welfare and the General Services Administration, there were 37 Federal installations as of December 31, 1960 discharging sanitary waste effluents of 10,000 gal/day or more into the waters of the Region. These include activities on property owned or leased by the Federal Government within the Project Area. Of this total, eight waste sources originate in New York and 29 in New Jersey. Data limitations indicate that at least six Federal facilities, all discharging raw wastes, require abatement action. These are listed in Table III-2 among the most urgent Priority category (I). All six discharge into interstate waters. In addition to these 37 Federal sources discharging wastes into the Region's waters, 38 others discharge their waste directly into New York City sewers.

OTHER POLLUTION PROBLEMS

Stormwater Runoff

There are 31 municipal sewerage systems in the Metropolitan New York Region that have some combined stormwater-sanitary sewage collection. These systems serve an estimated 10,400,000 persons, nearly 80 percent of the entire sewered population. The majority and largest of these collection systems are located in New York City where over 200 outfalls release the combined stormwater and sanitary overflows of approximately 8,000,000 persons into the surrounding waters.

The FWPCA estimates the overflow from these systems during average periods can be roughly three percent of the total raw wastewater discharge. In addition to the discharge of untreated mixtures of sanitary sewage and stormwater, these overflows include large amounts of suspended solids, putrescible organic matter and bacteria which had previously settled to the bottom of sewers between storms.

The extent to which stormwater overflows may be affecting the beneficial use of the waters of the Region is not known. Investigations are necessary to determine the quality and quantity of stormwater overflow, the effect such discharges have on water quality of the receiving waters, and needed remedial measures with associated cost estimates.

Bottom Deposits

The continual discharge of inadequately treated domestic and industrial wastewaters has resulted in the formation of extensive sludge deposits and in

the contamination with oil and toxic chemicals of bottom sediments throughout the Metropolitan New York Region. The highly organic bottom deposits exert an additional oxygen demand on the Region's waters and destroy and/or inhibit the desirable growth of aquatic and marine organisms. The contamination of the bottom sediments also adversely affects the normal benthic growths and imparts undesirable tastes to marine species such as clams, etc. Recent Project data show that significant oil buildups are occurring in the bottom sediments of certain areas of Arthur Kill, Raritan Bay and the Hackensack River. These possible contributors to the water quality problems of the Region must be investigated further.

Dredging

Additional degradation of water quality within the Metropolitan New York Region can occur as a result of extensive dredging activities. Dredging authorized or carried out by the Corps of Engineers for the improvement and/or maintenance of navigation channels and for construction or fill materials can have deleterious effects on resources in the area of activity as well as the area of disposal. The disturbance of the bottom by dredges causes a re-suspension of accumulated organic sludges and silt which results in a greatly increased BOD. Material resuspended by dredging can also seriously disturb shellfish and finfish resources. Uncontrolled dredging can alter flow patterns by changing bottom topography and can make deep holes whose floors do not have free connection with channels of similar depth.

Disposal of dredged materials can create serious pollutional problems, if spoiled material is returned to the water and if the creation of such public health hazards is not prevented. Such operations can destroy the flats and marshes which serve as a nursery for fish and a refuge for wildlife.

Guidelines should be devised to coordinate and facilitate the mutual interests of all Federal, State and local resource agencies concerned with dredge and spoil areas. Procedures must be established to ensure that dredging projects will not create water pollution problems, public health hazards or destroy the natural resources.

Sanitary Landfill

Landfill operations contribute to the overall pollution of the waters of the Metropolitan New York Region. These operations are used for the disposal of refuse, garbage, incinerator residue and sludge from public sewage treatment plants. The pumpings from individual septic tank systems may also be discharged into these landfills. Usually there are insignificant amounts of human intestinal bacteria except in those fills which receive the pumpage from septic tank systems.

Pollution of the waters by this source in the Metropolitan New York Region occurs by horizontal leaching of surface, ground or tidal water. Vertical leaching by percolating water can affect ground water sources.

Known water pollution problems created by landfill operations include those at Belleville Pike in Kearny and at North Arlington, N. J. where refuse is dumped into open waters. The raw refuse floats freely on the surface presenting an unsightly appearance. In hot weather, the mixture of salt water and garbage causes bad odor problems.

Additional study and evaluation is necessary to determine the number and location of sanitary landfill operations and to what extent such areas are affecting water quality. The projected growing regional population and the increasing amount of waste that must be handled add emphasis to a need for study in this Region.

Ocean Disposal

The ocean area adjacent to the Metropolitan New York Region, generally known as the New York Bight, has long been used as a site for the disposal of rocks, mud, dredgings, sewage sludge and industrial wastes. Long Island Sound and the Hudson River are also used as dump areas. The major areas of the New York Bight which are now used as dumping grounds are shown in Figure VI-1 following page VI-25. Table VI-3 summarizes the total volume of wastes dumped at these sites for the years 1965 and 1966.

A preliminary appraisal indicates that the sewage sludge and waste acid may have the most significant pollutional effect on the ocean waters. Consistent criticism has been directed at the National Lead Company (Sayreville, N. J.) which dumps large quantities of acid wastes containing ferrous sulfate and sulfuric acid plus other trace materials. Although some scientific studies have been conducted by the Public Health Service in the acid dump area, no conclusive evidence as yet is available to indicate the extent these substances are affecting fish and other marine organisms, as well as migration and other related factors. However, some fishermen, based upon their years of experience and personal observation, report that since the acid dumping began in 1948, fishing in the area has declined.

The discharge of sewage sludge originating in New York City and other municipalities has not generally been the subject of complaint by local fishermen. There has been some limited investigation in this area. A preliminary study conducted by the Northeast Shellfish Sanitation Research Center reported a rapid reduction in bacteria in sewage sludge after it was discharged into the sea. The Center found that the MPN in the sludge before dumping was high, and decreased rapidly with distance from the center of the dump area. Coliform counts were found to be insignificant six miles from the dump. The study also found indications of considerable buildup of sediments on the ocean bottom.

The extent to which the disposal of the acid wastes and sewage sludge may be interfering with the beneficial use of the ocean waters of the New York Bight is not completely known. A comprehensive evaluation is necessary to accurately determine the effects of these pollutional sources on the ocean resource and fisheries. In addition, studies are necessary to determine

whether the disposal of cellar dirt and dredged materials are adversely affecting the ecology of the ocean waters. The importance of river-borne wastes flowing into the Bight should also be determined.

The disposal of radioactive wastes in the waters of the Bight is another area needing investigation. The increasing demand for ocean disposal of a variety of wastes and their possible cumulative effect on fishing and other legitimate water uses further emphasizes a need for comprehensive study in this area.

Septic Tanks and Cesspools

Within the Metropolitan New York Region, there are 1,100,000 persons in 370,000 housing units, as well as an unknown number of business establishments that dispose of domestic waste by individual septic tanks or cesspools. Population figures and housing units located within the New York City line are not included in these figures. These individual systems, although serving only an estimated eight percent of the 1960 population for the area, can cause serious localized pollutional problems. When the overflow from septic tanks is discharged directly into surface waters, significant bacterial pollution results.

In non-porous soils, tile fields often fail to handle septic tank overflows in a satisfactory manner, resulting in the overflow of effluent in backyards, streets and finally as surface runoff. Such conditions may be occurring in the rapidly expanding recreational areas around Greenwood Lake, where the impervious ground makes subsurface disposal impossible. Percolation of septic tank effluent into shallow ground water aquifers, which eventually discharge into springs, streams or lakes, adds pollutional material to these surface waters. Under certain geological conditions, deep aquifers can also become polluted by wastes from inadequate domestic disposal systems and result in public health problems in those areas where ground water is developed for individual and municipal water supplies.

Other substances besides bacteria are ineffectively treated by cesspools and septic tanks and have been found entering subsurface aquifers. Although specific information on ground water pollution by such materials is not at present readily available for the Metropolitan New York Region, experience in other areas such as Long Island, New York, indicate that the problem can be extremely serious. To prevent such problems will require detailed investigations of the extent and location of individual waste disposal systems as well as the geology of the underlying soil.

Eutrophication and Aquatic Vegetation

Certain waters in the Metropolitan New York Region are sufficiently enriched in both phosphorus and nitrogen to support abundant growths of aquatic weeds and algae. Such growths can interfere with pleasure boating, bathing and other recreational water use. Discharges of raw and treated municipal wastes are the major sources of nutrients. Other sources include the overflow or percolation from individual septic tank systems, direct discharges from recreational

boating and runoff from agricultural areas. The limited data available on the extent of this problem, and the causes and control methods to be used to prevent further interference with water use should be the subject of further study.

Recreational and Commercial Navigation

Boating is an important water use throughout the Metropolitan New York Region. Recreational and commercial boating activities can contribute significantly to the pollution of the waters within the Region. The four general types of pollution involved are sanitary waste discharges, litter, outboard motor exhaust, and oil. Sanitary wastes discharged from the many vessels in the Region represent the greatest health problem, particularly from the standpoint of pathogenic bacteria. Although, in most cases, the discharge of fecal matter from these vessels appears insignificant when compared to the size of receiving waters and to the municipal and industrial loads known to be discharged in and around the New York Harbor Complex, these wastes are introduced in very limited areas. For example, luxury liners in berth for short periods of time (such as 24 hours) to permit debarkation and loading of new passengers serve as quarters for as many as 1,000 crew members each. In addition, during this 24-hour period, a large number of visitors board the vessel and make use of all facilities. Similarly, pollution from recreational boats is often concentrated in the crowded, shallow and protected marinas where people are living "aboard ship". The State of New York has established regulations governing the disposal of wastewater from watercraft. The State of New Jersey also has regulations regarding the discharge of wastes from watercraft. The New Jersey regulations in their present form, however, do not apply to tidal waters.

The litter dumped overboard from commercial and recreational vessels also pollute the Region's waters. A large part of the litter dumped is made up of plastic food wrapping and glass, metal and waxed liquid containers. These items do not readily disintegrate in water, but float up on the beaches, resulting in the deterioration of the aesthetic quality of the environment.

The exhaust from outboard (and some of the newer inboard) motors is discharged directly into the water, resulting in contamination of the water by hydrocarbon residues. In restricted waters, such as the coves and inlets found along the shores of Raritan Bay and Long Island Sound, concentrations may reach levels detrimental to the natural biota, including shellfish.

One of the most significant forms of vessel pollution comes from oil spills, many of which go unrecorded, especially if they are of the lighter grades. These oil spills, resulting from pumping of bilges or from damaged tankers and barges, can cover large areas with sticky oil residue, making the shore and waters unsuitable for recreation. The Supervisor of the Harbor in the Office of the Chief, New York District, U. S. Army Corps of Engineers who carries out the enforcement of the Oil Pollution Control Act in the New York Harbor Area, reports that there were a total of 556 initial cases of oil pollution investigated in 1966. Of this total, 243 were complaints regarding Petroleum, Oil, Lubricant (P.O.L.), 270 refuse and 43 others.

Not all pollution attributable to navigation emanates from vessels. Some can be traced to the many shore facilities developed for servicing commercial and recreational watercraft and for oil storage. The New York State law mentioned also requires that owners of marinas provide suitable receptacles for disposition of litter from watercraft uses and facilities for the handling and disposal of sewage from holding tanks of watercraft so as to prevent pollution of the State's waters. New Jersey's law, on the other hand, does not require such shoreline facilities.

Thermal Pollution

Additional pollution in the Metropolitan New York Region results from the discharge of "hot" cooling water from fossil and nuclear powered electric generating plants and industrial establishments. These discharges affect the ability of the receiving waters to assimilate oxygen-demanding pollution, and can be a detriment to fish and other aquatic life. The Indian Point plant below Peekskill is the only nuclear reactor in the Region in the Region at present, although others, including one in Raritan Bay, are under consideration. Investigations will be necessary to determine the locations of all heated water discharges, their volumes and temperature rise, and the extent to which they the waters of the Region. The growing competitiveness of thermonuclear power plants and the continuing increase in industrial cooling water usage demonstrate the need for a more comprehensive study of the effects of heated waste waters on the Region's waters.

Hydrodynamic Considerations

The hydrodynamic balance or river and tidal flow in the New York Harbor complex is such that the system can be considered well mixed. The temperature, salinity and density gradients in the Harbor are non-existent or small, and so essentially the entire water volume is available for dilution.

The four hydraulic tidal straits in the Harbor area are Arthur Kill, Kill van Kull, and the Harlem and East Rivers. The tidal currents in these straits are so large that they completely mask the net flow. Furthermore, their phase relationship is such that material introduced almost anywhere in the system will be found throughout the entire harbor complex within a very few tidal cycles. Thus, one may consider every point in the system to be affected by what happens at every other point. Regional planning and cooperation in waste disposal is absolutely essential, since one ill-considered action could easily nullify many costly programs.

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
Lower Hudson River Basin				
Lower Hudson River Basin Total	33	+		
Lower Hudson River	20	+	II III	Mun.-Ind. Waste Combined sewers, recreational and comm. boating and hydrographic cond.
Croton River	6		II	Mun. Waste
Sparkill Creek	1	+	IV	Insufficient data
Annsville Creek	1			Insufficient data
Furnace Brook	2			Insufficient data
Pacantico River	2			Insufficient data
Minisceongo Creek	1			Insufficient data
Hackensack River Basin				
Hackensack River Basin Total	30	+		
Hackensack River	11	+	II III	Mun.-Ind. Waste Effects of Newark Bay and trib. streams, recreational and comm. boating, thermal poll. and unknown waste

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS (Cont'd)

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
Hackensack River Basin (Cont'd)				
Pascack Brook	6		II III	Mun. Waste Septic tank seepage and other unknown sources
Muddy Creek (Pascack)	2		II III	Mun. Waste Septic tank seepage and other unknown sources
Demarest Brook (Durakill)(Tenakill)	1		II III	Mun. Waste Septic tank seepage and other unknown sources
Tenakill Brook (Dwars Kill)	2		II III	Mun. Waste Septic tank seepage and other unknown sources
Bellmans Creek	1		II	Mun. Waste
Cromakill Creek	1		III	Mun. Waste
Mill Creek	1		III	Mun. Waste
Berry Creek	3	+	III	Mun.-Ind. Waste
Misc. Streams	2	+	II III IV	Mun. Waste Ind. Waste Other Waste sources

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS (Cont'd)

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
		Passaic River Basin		
Passaic River Basin Total	27	+		
Passaic River	8	+	II III	Mun. Waste Effects of Newark Bay and trib. streams, and bottom sludge deposits and other unknown Waste sources
Dead River	1		II	Mun. Waste
Whippany River	2	+	II	Ind. Waste
Rockaway River (Whippany)	2		III	Mun. Waste and low flow conditions
Pompton River	1	+	III	Mun.-Ind. Waste
Pequanock River (Pompton)	1		I	
Ramapo River (Pompton)	3	+	III	Mun.-Ind. Waste, septic tank seepage
Packanack Creek (Pompton)	1		III	Mun. Waste and other unknown Waste

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS (Cont'd)

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
Passaic River Basin (Cont'd)				
Singac Brook	1	+	III	Mun.-Ind. Waste
Peckman River	4		III	Mun. Waste
Saddle River	2		III	Mun. Waste, floating material and other unknown waste sources
Greenwood Lake	-	-	III	Septic tank seepage, rec. boating
Hohokus Brook (Saddle River)	1	+		
Raritan River Basin				
Raritan River Basin Total	12	+	II	Mun.-Ind. Waste
Raritan River	7	+	III	Tidal contrib., comb. sewer overflows, oil storage leaching, thermal discharges.
South Branch	1	+	II	Mun.-Ind. Waste
			III	Other unknown waste sources
Millstone	4	+	II	Mun. Waste
			III	Septic tank seepage and agricultural runoff.

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS (Cont'd)

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
East River				
East River Total	11	+		
Long Island Sound	1	+	II	Mun.-Ind. Waste
			III	Rec. and Comm. boating, hydrographic cond., bottom deposits, comb. sewer outfalls
East River	2	+	II	Mun.-Ind. Waste
			III	Rec. and Comm. boating, comb. sewer outfalls
Upper New York Harbor to Narrows				
Upper N. Y. Harbor to Narrows Total	12	+		
Upper New York Bay	7	+	II	Mun.-Ind. Waste
			III	Rec. and Comm. boating, dredging activities, comb. sewer outfalls, hydrographic conditions
Kill Van Kull	3	+	II	Mun.-Ind. Waste
			III	Rec. and Comm. boating, comb. sewer outfalls
Unknown	1		IV	Insufficient data

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS (Cont'd)

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
Lower New York Harbor				
Lower N. Y. Harbor Total	11	+		
New York Bay	5	+	II	Mun.-Ind. Waste, flow from Upper Bay
			III	Rec. and comm. boating, dredging activities, comb. sewer outfalls
Jamaica Bay and Rockaway Inlet	6		II	Mun. Waste
			III	Rec. boating, dredging activities, and comb. sewer outfalls, sludge disposal
Raritan Bay				
Raritan Bay Total	15	+		
Raritan Bay	11	+	II	Mun.-Ind. Waste
			III	Rec. and comm. boating, dredging activities, thermal poll., storm water overflows
Sandy Hook Bay	2	+	II	Mun. Waste
			IV	Other unknown Waste sources
Matawan Creek	2		III	Mun. Waste

TABLE VI-1

METROPOLITAN NEW YORK REGION
WATER QUALITY PROBLEM AREAS (Cont'd)

Name of Water	Number of Pollution Discharges [a] Municipal	Industrial [b]	Category	Problem
		Arthur Kill		
Arthur Kill Total	7	+		
Arthur Kill	6	+	II III	Mun.-Ind. Waste Rec. & comm. boating, bottom deposits of oill & toxic materials
Rahway River	1	+	II	Mun. Waste & effects of Arthur Kill
Woodbridge Creek	0	+	III	Mun. Waste & effects of Arthur Kill
Bridge Creek	0	+	III	Ind. Waste & effects of Arthur Kill
		Connecticut Basin		
Connecticut Basin Total	15	+		
Long Island Sound	10	+	III	Mun.-Ind. Waste & other unknown waste sources
Byram River	1	+	III	Mun.-Ind. Waste & other unknown waste sources
Other Rivers	4	+	III	Mun.-Ind. Waste & other unknown waste sources
		Miscellaneous		
Miscellaneous Streams	25	+	IV	Insufficient data

a/ Thirty-eight Federal plants discharging into New York City Sewers are not included.

b/ Waters (streams etc.) marked with a + symbol are suspected of receiving one or more industrial outfalls.

TABLE VI-2

WASTE SOURCES IN
METROPOLITAN NEW YORK REGION
SUMMARY

INTERSTATE WATERS

State or City	Municipal & Institutional		Federal	
	No.	Population Served (000)	No.	Population Served (000)
New York City	17	8,435.0	a/	na
New York State b/	40	831.9	8	na
New Jersey	51	3,558.9	15	na
Connecticut	14	342.9	-	-
	122	13,168.7	23 a/	

INTRASTATE WATERS

State or City	Municipal & Institutional		Federal	
	No.	Population Served (000)	No.	Population Served (000)
New York City	-	-	-	-
New York State b/	8	20.0	-	na
New Jersey	30	254.0	14	na
Connecticut	1	2.5	-	-
	39	276.5	14	
	161	13,445.2	37 a/	

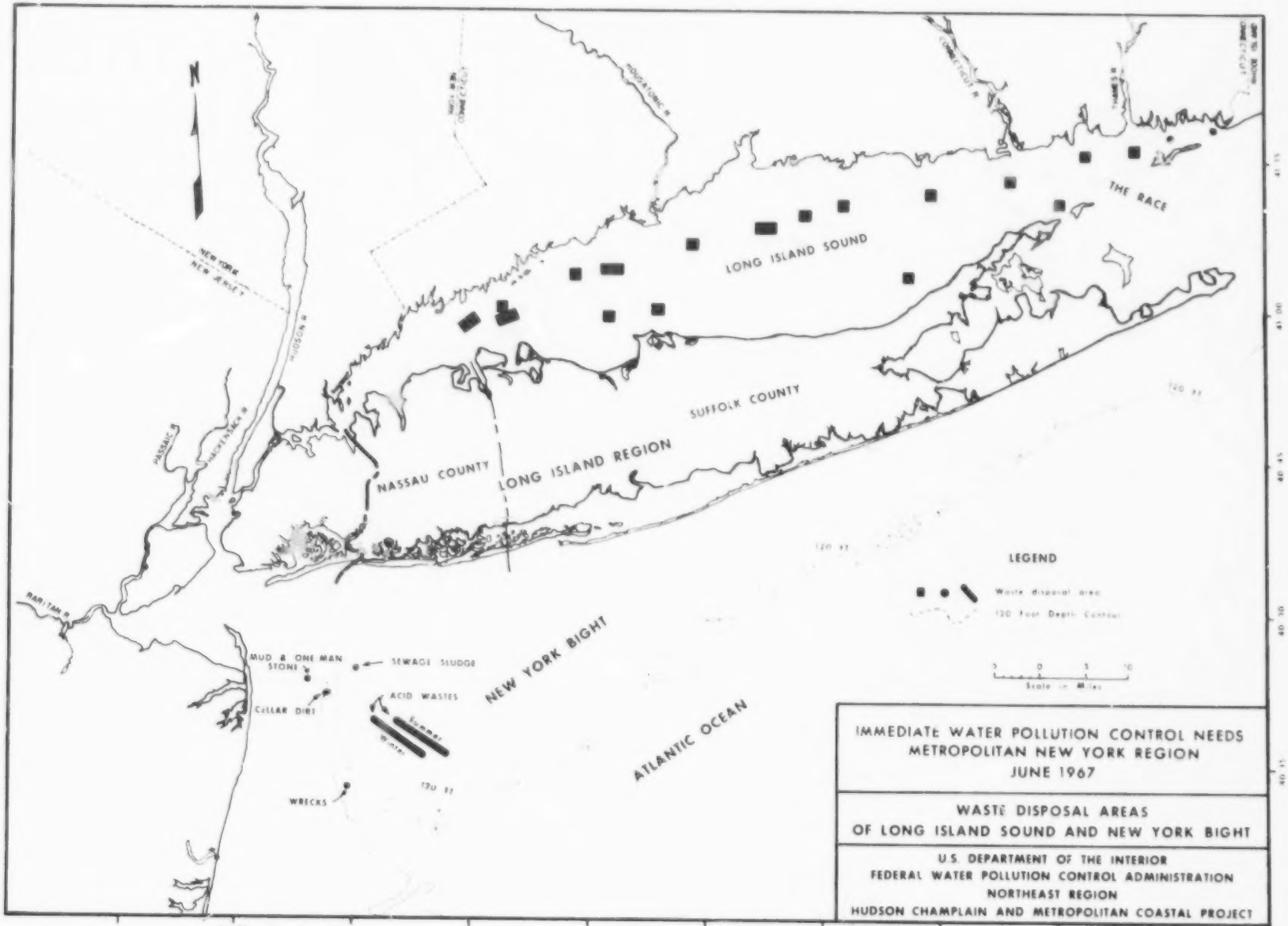
a/ Thirty-eight Federal plants discharging into New York City sewers are not included.
b/ New York State Totals do not include the data for New York City.
na Data not available.

TABLE /I-3

TOTAL ANNUAL VOLUME OF SEVERAL WASTES
DUMPED IN THE NEW YORK BIGHT
(CUBIC YARDS)

Type o' Waste	1965	1966	Two Year Total
Waste Acid	2,589,519	2,854,646	5,444,165
Sewage Sludge	3,417,318	4,202,004	7,619,322
Gov't Dredging	3,322,183	3,772,847	7,095,030
Cellar Dirt	851,575	816,794	1,668,369
Mud & Steam Ashes	2,109,508	3,939,187	6,048,695

Source: U. S. Army Corps of Engineers.



IMMEDIATE WATER POLLUTION CONTROL NEEDS
METROPOLITAN NEW YORK REGION
JUNE 1967

WASTE DISPOSAL AREAS
OF LONG ISLAND SOUND AND NEW YORK BIGHT

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION
HUDSON CHAMPLAIN AND METROPOLITAN COASTAL PROJECT

FIGURE 1

VI-25

VII - DESCRIPTION OF THE REGION

LOCATION

The Metropolitan New York Region includes the New York City complex, consisting of Bronx, New York, Queens, Kings and Richmond Counties, all of Rockland County and Westchester County, most of Putnam County and small segments of Dutchess and Orange Counties in New York State. This Region also contains major portions of 12 northeastern New Jersey counties and over three-quarters of Connecticut's Fairfield County.

The Region is rather pear shaped, with a north-south dimension of about 120 miles and an east-west span of 80 miles. The total land area is about 3,950 square miles. The Region includes land drained by the Hudson River and all the tributaries entering south of the vicinity of Bear Mountain Bridge, which is located at the northern boundaries of Rockland and Westchester Counties. The Region also includes the drainage basin of streams entering New York Harbor north and west from Sandy Hook and streams entering Long Island Sound west of the Housatonic River.

The major rivers included are the Hudson (to the Bear Mountain Bridge), Hackensack, Passaic and Raritan Rivers. Also included is the New York Harbor complex which includes the Arthur Kill, Kill van Kull, Raritan Bay, Sandy Hook Bay, Lower Bay, Upper Bay, Harlem and East Rivers, and a small portion of the western end of Long Island Sound.

The New York Harbor area is not only the point of confluence of the rivers, but of the physiographic and geologic provinces as well. The "Fall Line" running north-eastward from Trenton to Perth Amboy and thence toward Connecticut, separates the Atlantic Coastal Plain from the Piedmont Plain. The physiographic regions are thus in sharp contrast; the flat sandy coastal plains in the Monmouth County, Staten Island, and Long Island areas are highly different from the three bands of the Piedmont Plateau to the north.

TOPOGRAPHY

The Atlantic Coastal Lowland with its gently sloping smooth plain rarely has elevations above 300 feet. North of the Fall Line are three northeastward oriented parallel bands of plains and hills which gradually increase in elevation from 300 foot hills in the Raritan Basin to steep-sided 1,000 foot mountains at the northwestern edge of the Wallkill River Basin. The western Connecticut Coastal Area is quite similar with low hills and ridges rising above open valleys.

GEOLOGY

In geologic terms the New York Harbor Area is the meeting place of the New England Upland, the Triassic Lowland, and the Coastal Plain.

The Atlantic Coastal Plain is underlain by poorly consolidated Quaternary, Tertiary, and Cretaceous sediments that dip gently seaward. Long Island is composed of marine quaternary bedrock while the portions of New Jersey in the Coastal Plain are tertiary and cretaceous. In New Jersey south of the "Fall Line" the mantle is a southeastward thickening wedge of various layers of thick sands, gravels, and clays.

The major portions of the Raritan, Passaic, and Hackensack River Basins are in the Triassic Lowlands of the Piedmont. The area is characterized primarily by a lowland of smooth, rounded hills separated by wide valleys, with some ridges and isolated hills standing prominently above the general surface. The Piedmont is underlain by red shales, sandstones, argillites, and basalt lava flows. Unconsolidated glacial or related deposits mantle most of the province. These sediments have been intruded by a mass of diabase nearly 1,000 feet thick called the Palisades, which extends from Haverstraw, New York southwestward to Princeton, New Jersey.

East and north of the Hudson River at the Palisades, extending into the Connecticut Coastal Basin, are a series of crystalline rocks of the Pre-Cambrian and Paleozoic ages called the New England Upland. Manhattan Island, too, is included in this Region. The Taconic Mountains extend in a north-south direction along the eastern border of New York State. The bedrock here is largely Cambrian and Ordovician slates and schists underlain by limestone which is occasionally exposed in the valleys. Elevations may exceed 2,000 feet. Two lower regions to the south are the Hudson Hills and the Manhattan Hills which extend into the Connecticut Coastal Basin. Elevations here reach about 1,000 feet and 500 feet, respectively. Composition of the bedrock is mostly granite-gneiss and schist.

HYDROGRAPHY

Average annual precipitation in the Region is about 43 inches, distributed fairly evenly over the year.

Surface waters in the Region drain to the Atlantic Ocean via New York Harbor or Long Island Sound. Average discharge for gaged streams in the Region is about 16,800 cfs, of which the Hudson River contributes almost 14,000 cfs.

The Hudson River estuary extends from beyond the north boundary of the Region to the mouth of Lower New York Bay. It includes Upper New York Bay, Newark Bay and Raritan Bay, as well as the subestuaries of the rivers tributary to these bays. The bays are connected to each other and to Long Island Sound by four tidal straits known as Arthur Kill, Kill van Kull, Harlem River, and East River.

Although the Hudson has a four foot tide for the 150 miles from the sea to Troy, its water is salt for only about half this distance, to a point beyond the Region's northern limit. From the George Washington Bridge in New York City to the Bear Mountain Bridge, the Hudson may be considered a partially stratified estuary. Pollutants introduced in the upper layer tend to move toward the sea,

but those in the lower layer move in the opposite direction. Tidal currents in this reach are less than one and a half knots on the flood and two and a half on the ebb.

The remainder of the Hudson River estuary may be considered well mixed. After several tidal cycles contaminants introduced anywhere in the harbor waters can be detected almost anywhere in the harbor. Extreme tidal currents in the harbor area exceed five knots in Hell Gate and the vicinity of Blackwell's Island in the East River.

The Lower Bay empties into the New York Bight, where the general drift is southerly. Close to shore the currents, though variable, tend to flow towards the New York Harbor mouth along the New Jersey and southern Long Island coasts. The bottom currents in the Bight have a definite onshore component, necessitating great care in the disposal of long lived pollutants. The Hudson Channel across the continental shelf to the Canyon is punctuated by isolated basins which preclude the possibility of large scale solids disposal along it to the edge of the continental shelf.

The western end of Long Island Sound is also quite well mixed and what net drift there is appears to be toward the east. Tidal currents in the Sound may reach one knot near certain points.

SOCIO-ECONOMIC CHARACTERISTICS

Population in the Metropolitan New York Region was calculated to be 13,624,860 in 1960 (the year of the last U. S. Census). Population in this Region is expected to grow to 18,067,000 by 1990 or a little more than one percent per year, according to estimates developed by state and private agencies, as shown in Table VII-1.

In 1960, population in the Metropolitan New York Region was distributed as follows: 8,779,926 New York State residents (roughly two-thirds of the Region total), 4,311,605 New Jersey residents and 533,329 Connecticut residents. Included in the New York State resident figure is the City of New York, which consists of five major counties--Bronx, Kings, New York, Queens and Richmond--with a 1960 population of 7,781,984 or roughly 90 percent of the total New York State resident figure. By 1990 it is anticipated that population in the New York State portion of the Region will number 10,121,000 and account for a smaller proportion (56 percent) of the Region's population. Conversely, New Jersey's share by 1990 will rise from a third to more than 39 percent of the Region total when 7,071,000 Jerseyites will inhabit the state. The Connecticut portion will advance to 875,000 by 1990. New York's growth is expected to rise only 15 percent because of New York City's almost imperceptible change (only 4 percent over the 30 year period). The above population changes indicate that substantial growth will occur in areas outside New York City but within the Region.

The Metropolitan New York Region has an area of 3,950 square miles, of which New Jersey has 60 percent or 2,299 square miles, New York City has 314 square miles and the five other counties in New York State within the Region

have 934 square miles. The remaining 403 square miles of the Region lie within Fairfield County, Connecticut.

A review of population data for the Metropolitan New York Region shows unusually high densities for four of the five New York City counties. New York County (Manhattan) with 77,000 persons per square mile has the highest. The table indicates, however, that New York and Kings Counties will experience declines in population by 1990. The resident population figures for New York City do not reflect the daily influx of hundreds of thousands of workers engaged in industrial business, financial service, and government activities.

Over 2 million people work in the 9 square mile area of Manhattan, between 59th Street and the Battery. At the southern end of Manhattan, in the Financial District, 130,000 people work in an area of only six tenths of a square mile. From 34th Street to 40th Street, between 6th and 9th Avenues, 200,000 people are engaged in the design and manufacture of garments.

New York City also received over 16 million visitors in 1964, or about 44,000 persons per day every day of the year, from all parts of the U. S. and the world.

The New Jersey area's anticipated increase of 64 percent in population density between 1960 and 1990 may be attributed to the fact that more people are moving to the suburbs, although many are continuing employment in the New York City business district. In recent years, selected enterprises have also relocated in the suburban counties of New York State and New Jersey.

One of the factors contributing to the relatively high New York City population density level has been the accelerated construction of new high-rise apartments, and the continued replacement of old apartment buildings with new and taller ones. The New York City's high population density may make possible a more economical water supply and waste disposal operation because per capita costs usually decrease as the population density increases.

Analysis of the employment patterns of wage and salary workers covered by Social Security in the Region shows that in 1964, 1,690,000, or 35 percent, of the 4,854,000 covered workers were engaged in manufacturing. Wholesale and retail trade together provided the second largest source of employment with 1,157,000 jobs. Persons engaged in a wide range of service activities (bartenders, bankers, and bus drivers) comprised the third largest employment category, numbering 902,000. The balance are engaged in various other categories such as transportation, finance, insurance and real estate, and contract construction.

The Region contains a wide variety of industries, however, only four major manufacturing industries: apparel, electrical machinery, printing and publishing and food products, accounted for half the Region's total factory employment.

More than 3.3 million persons or 68 percent of the Region's total covered employment force work in New York State. Almost 93 percent of these are employed in New York City. New Jersey's industries employ 1.3 million or 28 percent of the Regional total and the balance of 178,000 work in Fairfield County, Connecticut.

TABLE VII-1

DISTRIBUTION AND PROJECTION OF POPULATION
IN THE METROPOLITAN NEW YORK REGION, BY REGION
AND COUNTY, 1960 and 1990

Region and County	Total County Population 1960	HCMC Project % Population 1960	Metropolitan New York Region % Population 1960 2/	Population 1960	Population 1990
Metropolitan New York Region Total		70.6 1/		13,624,860	18,067,000
Bronx	1,424,815	100.0	100.0	1,424,815	1,449,000
Kings	2,627,319	100.0	100.0	2,627,319	2,504,000
New York	1,698,281	100.0	100.0	1,698,281	1,422,000
Queens	1,809,578	100.0	100.0	1,809,578	2,223,000
Richmond	221,991	100.0	100.0	221,991	489,000
Dutchess	176,008	100.0	0.2	300	1,000
Orange	183,734	92.0	12.2	22,327	61,000
Putnam	31,722	100.0	93.4	29,622	114,000
Rockland	136,802	100.0	100.0	136,802	444,000
Westchester	808,891	100.0	100.0	808,891	1,414,000
New York State Total	9,119,141			8,779,926	10,121,000
Bergen	780,255	100.0	100.0	780,255	1,209,000
Essex	923,545	100.0	100.0	923,545	1,036,000
Hudson	610,734	100.0	100.0	610,734	626,000
Hunterdon	54,107	69.5	100.0	37,580	99,000
Mercer	266,392	18.9	100.0	50,378	80,000
Middlesex	433,856	100.0	100.0	433,856	1,077,000
Monmouth	334,401	99.0	48.1	160,971	417,000
Morris	261,620	98.7	100.0	258,220	708,000
Passaic	406,618	100.0	100.0	406,618	623,000
Somerset	143,913	100.0	100.0	143,913	432,000
Sussex	49,255	47.3	2.6	1,280	4,000
Union	504,255	100.0	100.0	504,255	760,000
New Jersey State Total	4,768,951			4,311,605	7,071,000
Connecticut					
Fairfield	653,589	100.0	81.6	533,329	875,000

1/ Total 1960 HCMC Project Population - 19,292,000.
2/ Refers only to the Metropolitan New York portion within HCMC Project.

Sources: U. S. Bureau of the Census, 1960; Projective Economic Studies of New England, Arthur D. Little, Inc., Cambridge, Massachusetts, 1964-1965; Demographic Projections, New York State Office of Planning Coordination; New Jersey Department of Conservation and Economic Development, Sept. 1966. Population distributions calculated by Project personnel.

VIII - WATER USE

WATER SUPPLY

Present Demands

The following information on present water supply systems in the Metropolitan New York Region, serving more than 1,000 persons each, is based on the 1963 FWPCA Municipal Water Facilities Inventory and on State and other data, and summarized in Table VIII-1.

Within the Region, there are 110 known municipal water supply systems which serve approximately 13,100,000 persons, with an average daily consumption of 2,000 MGD or 152 gallons per capita. Of these systems, 25 serving 10,200,000 persons (78 percent of the total) with 1,610 MGD rely solely on surface sources. Sixty-three systems serving 1,250,000 persons utilize only ground water sources, and 22 systems serving 1,650,000 persons use a combination of both surface and ground water sources.

There are nine systems in New Jersey and three in New York serving New York City that furnish 82 percent (1,645 MGD) of the total daily consumption to a population of approximately 12,000,000 persons. These systems are listed in Table VIII-2.

The total average industrial water demand, including brackish water, in the Metropolitan New York Region for 1962 was 5,700 MGD. This figure is based on a study of the 1962 manufacturing employment in the Region and on average ratios of water use per employee reported by the 1958 Census of Manufacturers Industrial Water Use Report. This reference provides data for manufacturing industries using 20 million gallons of water or more per year. The information was reviewed for each of the regions designated by the Bureau of Census, and relationships for the Delaware-Hudson Region were modified to reflect the nature of the industries located in the Region.

Of the total industrial water used, 4,900 MGD were used for cooling operations and 800 MGD for process water of which 300 MGD were municipally supplied. It might be pointed out that 3,900 MGD of the total cooling waters are accounted for in the Metropolitan New York Region, where the primary use of the river and harbor water is for cooling purposes by steam generating plants and industries. Industrial use in this Region amounts to 3,743 MGD from the Harlem and East Rivers, 165 MGD from the Hudson River and 16 MGD from the Kill Van Kull.

An estimated 149,000 rural, domestic and agricultural housing units utilize individual wells and other private water supply sources. These systems supply an estimated 62 MGD of domestic and agricultural water to approximately 450,000 persons. Ground water aquifers are the primary source of these supplies.

The amount of water being used in the Region for irrigation purposes is not considered significant.

Future Requirements

The following estimates of future water supply needs in the Metropolitan New York Region are based upon population projections as outlined in Section VII of the Report, the present per capita water consumption, and trends in the per capita water consumption for the Region as reported by the Senate Select Committee on Water Resources.

Average daily water consumption in the Region in 1966 is estimated as 151 gallons per capita. It is projected that by the year 1990 this usage will have increased to approximately 240 gallons per day, 76 percent of which is attributed to domestic, commercial and other public use with the remaining 24 percent allocated to industrial use. This distribution of the projected 1990 per capita water use can vary markedly depending upon the dynamics of growth and demand registered by industry and all other users. Technological advances in home appliances, and changing recreational uses and commercial demands may accelerate the projected upward trend towards more liberal water use patterns.

It is estimated that by 1990 the municipal water needs in the Metropolitan New York Region will amount to 3,300 MGD, with 2,500 MGD for domestic, commercial and other public use and the balance for industrial requirements. This increased consumption is over one and one half the current water usage.

Because of the enormity and complexity of the industrial development in the Metropolitan New York Region, future water demands in the self-supplied industrial category cannot be predicted at this time. A comprehensive inventory must be performed before any water use predictions can be made.

Future needs (1990) which can exceed dependable yields in many parts of the Region may only be met by programs aimed at the comprehensive development of the Region's limited surface water resources, and, to some degree, by the greater utilization of ground water supplies. The recent water shortage in the Metropolitan Region emphasized the urgency of the current water situation and the need to prepare for the future.

Resource development projects presently being considered are:

(1) Two reservoir sites on the Passaic River, at Two Bridges and Stirling. These sites are presently under study by the Corps of Engineers.

(2) A tidal dam at South River is presently under design by the State of New Jersey to protect the Old Bridge and Farrington ground water aquifers from salt intrusion and increase the yield from these sands.

(3) A tidal dam on the Raritan River at Crab Island. This project presently under study by the Corps of Engineers will provide water supply and insure against salt water intrusion of ground water aquifers.

(4) The North Branch Raritan River can be developed by off-channel storage or pump diversion to a reservoir on the Passaic River near Stirling.

(5) Possible development of groundwater storage in the Pennsauken Formation in the Upper Millstone River Basin.

(6) Development of the Hudson River with intake located above Poughkeepsie to serve the New York City Area.

(7) Development of ground water supplies, particularly in the Passaic River Basins, can be accomplished by the many systems throughout the Region.

RECREATION

An important facet of water use in the Metropolitan New York Region is recreational activities. The major recreational water uses are bathing, boating, and sportfishing.

Bathing

A large number of bathing beaches and waterfront parks are scattered throughout the Region. A majority of these facilities serve the concentrated population centers of Westchester County, Rockland County, New York City and the contiguous New Jersey areas. At least 29 public beaches and waterfront parks are on the banks of the Hudson River, but pollution makes swimming unsafe downstream from Kingsland Point Park in North Tarrytown. Authorized swimming areas are Croton Point Beach and Nyack Beach State Park. Despite polluted conditions there is some unauthorized swimming along the Manhattan-New Jersey stretch of the Hudson River. There are also 59 active beaches in Raritan Bay and the Arthur Kill, 17 of which are municipally owned. The many lakes and ponds located in the Croton River drainage basin and not owned by New York City are used for bathing and general recreational purposes. Lake Mahopac, Lake Carmel, Putnam Lake and Peach Lake are examples. The upper reaches of this watershed, especially in Putnam and Dutchess Counties, are used extensively for private summer camps.

Recreational Boating

Recreational boating is prevalent throughout the Region, and this activity is becoming an increasingly popular pastime, especially on the main stem of the Hudson River. The large numbers of marinas and yacht clubs are indicative of the extensive use made of these waters for pleasure boating. There are at least 37 private marinas and yacht clubs on the Hudson River between Peekskill and Ellis Island, and 18 other marinas located on Long Island Sound at City Island alone. There are also two large marinas for the mooring and launching of recreational craft along the lower Hackensack River.

The New York Harbor and its adjacent and contiguous waters are of principal interest to the boating enthusiast en route from home ports in New Jersey, New York, Long Island and Connecticut. These waters must be crossed before entering the Intracoastal Waterway system. Many cabin cruisers and other recreational craft can be expected to visit the Region during the peak boating months.

In 1966, more than 500,000 boats were registered in the State of New York, 350,000 of which were power driven. Only 60,000 of these craft have toilets. The State of New Jersey Department of Conservation and Economic Development reports that about 90,000 boats were registered in that state in 1963. The State of New York estimates that by 1980 the number of pleasure boats will nearly triple, and boating in New Jersey is expected to increase at nearly this same rate. The planned or proposed moorings and berths in the Raritan Bay area which will more than double the present capacity of facilities surveyed in 1963 are examples of what can be anticipated in future expansion of boating activities. It is evident, therefore, that the development of marina and associated facilities to meet present and future growth will result in greater pollution unless closer regulatory and surveillance activity is provided.

Sport Fishing

There is a great deal of sport fishing activity in the Region because of the dense populations' proximity to a variety of fish grounds. The Hudson River, because of its estuarine characteristics, can support both salt and fresh water fish, and has served in the past as a large resource for sport fishing activities as well as commercial fishing. Sport fishing in the Raritan Bay Area begins as soon as the weather breaks in March and continues well into autumn. A recent sport fishing survey conducted by the New Jersey Division of Fish and Game, indicated that there were about 330,000 fisherman-days' use of the New Jersey section of the Raritan Bay Area during 1963. Sport fishing in the New York section of Raritan Bay is confined mostly to the shore. Party boats also operate in the Region. An estimated 25,000 fisherman-days were expended in 1963 in the New York section of Raritan Bay. There are also many sport activities in the tributaries to the Hudson River, New York Harbor and Raritan Bay. Many of the streams and surface impoundments in the Croton Watershed are fished extensively for warm and cold water species. At present, fishing in many sectors of the Metropolitan New York Region is not fully exploited because of water pollution problems. On the Hudson, there is a natural reluctance on the part of fishermen to work adjacent to the discharge of raw wastes. The increase in the pollutional load in the waters of Raritan Bay has had a significant adverse effect on fish species. Fish and other aquatic life are non-existent in the Lower Hackensack and Passaic Rivers.

Waterfowl

Many segments of the Metropolitan New York Region presently serve as resting areas for waterfowl during migration periods. However, the present hunting use of this waterfowl resource is limited. The discharges of domestic and industrial wastes, and the dredging and filling of marshlands to expand residential and commercial facilities cause the decline of this natural resource. Improvements in water quality conditions and the preservation and enhancement of desirable natural land areas can be positive steps toward the development of this natural recreational resource.

COMMERCIAL FISHING

The commercial fin and shellfish industry was an important resource in the Metropolitan New York Region for many years. However, a combination of overfishing and man-made environmental changes, including those resulting from water pollution, has reduced the value of this use. Data from the New York Conservation Department indicate a continual decline in the commercial fishing harvest in recent years. This reduction is primarily attributable to a 50 percent decline in the shad catch and a 65 percent reduction in the striped bass catch. Closely related to the degradation of the waters of Raritan Bay is the related decrease in the availability of the shellfish resources. As a result of sewage pollution, more and more shellfish grounds have been closed until in 1961, almost 90 percent of the original grounds had become unavailable.

COMMERCIAL NAVIGATION

The Port of New York is the largest in the United States. The total amount of waterborne commerce of the Port of New York exceeded 150,000,000 short tons in 1960. Navigation is presently a major use of the Upper Harbor and lower portion of the Hudson River. There are 90 piers in New York alone between the Battery and 72nd Street. Additional piers are located on the New Jersey side of the river. The New York-New Jersey Channel which traverses Raritan Bay is an important part of the operation of New York Harbor. Approximately one-fourth of the larger vessel traffic entering or departing the port traverses this channel. In both 1960 and 1961, annual totals of more than 120,000 vessel trips were made through Raritan Bay Channels. Of these, 4,000 trips annually were made by ships of 20 feet draft or deeper.

The Hackensack River is navigable from its mouth to the Oradell Dam at New Milford. Recent improvements of the river by the Corps of Engineers have enhanced navigation facilities in Newark Bay, Hackensack River and Passaic River.

The Hudson River from Troy to the Atlantic is deep enough to handle ocean going vessels, and there is extensive use of this waterway for both freight and sightseeing commerce.

TABLE VIII-1

MUNICIPAL WATER FACILITIES
SERVING 1000 PERSONS OR MORE,
METROPOLITAN NEW YORK REGION
SUMMARY

State & Source	Facilities Number	Est. Pop. Served	Amount Withdrawn (MGD)
Surface			
New York	11	7,600,000	1,200
New Jersey	10	2,400,000	389
Connecticut	4	200,000	22
	25	10,200,000	1,611
Wells			
New York	10	600,000	27
New Jersey	53	650,000	102
Connecticut	-	-	-
	63	1,250,000	129
Both			
New York	7	140,000	13
New Jersey	13	1,200,000	154
Connecticut	2	310,000	69
	22	1,650,000	236
	110	13,100,000	1,976

Sources: Municipal Water Facilities, 1963 Inventory; Municipal Water Facilities Communities of 25,000 Population and Over, January 1, 1964, both U.S. Public Health Service, Basic Data Branch; and files of the FWPCA.

TABLE VIII-2

MAJOR WATER SUPPLY SYSTEMS,
METROPOLITAN NEW YORK REGION

Name	Pop. Served	Amount Withdrawn (MGD)	Source of Supply
Elizabethtown Water Company	420,000	48.0	Raritan R., Millstone R; Delaware & Raritan Canal; and 130 wells.
Jersey City Water Department	360,000	60.0	Rockaway River.
Newark Water Department	350,000	58.0	Pequannock River.
N. Jersey District Water Supply Comm.	660,000	114.0	Wanaque Res., Ramapo R. and Pompton Lakes.
Passaic Valley Water Commission	220,000	35.0	Passaic River.
Commonwealth Water Company	210,000	20.0	Passaic River, Canoe Brook and 25 wells.
Middlesex Water Company	160,000	24.0	Rahway River and 30 wells.
Hackensack Water Company	700,000	65.0	Hackensack River, tributary stream and wells.
New York City Dept. of Water Supply, Gas & Electricity	7,800,000	1,151.0	New York Watershed, Croton River.
Monmouth Consol. Water Company a/	230,000	53.0	Swimming River, Jumping Brook, Walepond Brook, Shark River Brook and 9 wells.
Jamaica Water Supply a/	540,000	14.0	121 wells
New York Service Corp. a/	200,000	12.0	Wells

a/ Also serves communities outside of New York Metropolitan Region.

Sources: Municipal Water Facilities, 1963 Inventory; Municipal Water Facilities Communities of 25,000 Population and Over, January 1, 1964, both U.S. Public Health Service, Basic Data Branch; and files of the FWPCA.

APPENDICES

APPENDIX A

CRITERIA FOR PRIORITY DETERMINATION

A system of priority ranking was developed for municipal and industrial construction needs, based on a series of criteria which indicate the urgency of abatement for each waste source. These criteria, which are in the form of a weighted scoring system, were applied to each known waste source. All sources were then ranked on the basis of final score, and divided into four priority groups, on the basis of engineering and economic judgment.

The criteria used to evaluate and rank the municipal treatment needs are presented in Table A-1. The scoring system includes such factors as existing treatment type, BOD loading discharged, size and use of the receiving stream, and previous enforcement activity.

A separate set of criteria which recognize the variation in industrial waste characteristics, were developed to rank industrial needs by priority. These criteria, shown in Table A-2, include such factors as waste toxicity, solids and color in addition to the factors used for municipal waste.

TABLE A-1

PRIORITY CRITERIA - MUNICIPAL WASTES

Aggregate Weight Adjusting Factors

		Percent
I	Type of Treatment.	35
II	Population Equivalents (P.E.)-Discharged (BOD) . . .	25
III	Receiving Water Use and Dilution	35
IV	Prior Orders Issued.	5

Enumerated Categories by Weight

I.A Type of Treatment

Bases	Wt.
No Treatment	100
Primary - No Chlorine - Overloaded	90
Primary - Chlorine - Overloaded	80
Primary - No Chlorine - Within design	70
Primary - Chlorine - Within design	60
Intermediate - No Chlorine - Overloaded	80
Intermediate - Chlorine - Overloaded	70
Intermediate - No Chlorine - Within design	50
Intermediate - Chlorine - Within design	40
Secondary - No Chlorine - Overloaded	70
Secondary - Chlorine - Overloaded	60
Secondary - No Chlorine - Within design	30
Secondary - Chlorine - Within design	0

II.A P. E. Discharged

BOD Range	
0 - 100	5
100 - 1000	10
1000 - 10,000	25
10,000 - 100,000	50
Over 100,000	100

III.A Receiving Water Use and Dilution

A Use

Drinking Water	80
Shell Fishing and/or Recreation	38
Sport Fishing	25
Other Uses	10

B Dilution

Large	0
Medium	15
Small	50

IV.A Prior Orders Issued

	Wt.
Yes	100
No	0

APPENDIX B

CONSTRUCTION ACTIVITY CODING

Two basic assumptions were used throughout in determining construction needs. Minimum acceptable treatment was defined as secondary treatment for municipal waste or its equivalent for industrial waste. All existing treatment plants constructed more than 20 years ago were considered obsolete and in need of complete replacement.

A system of construction coding was formulated to indicate the kind and amount of construction activity required to abate each municipal and industrial waste discharge. Each source was coded by an activity as shown in Tables B-1 (Municipal) or B-2 (Industrial).

TABLE B-1

MUNICIPAL CONSTRUCTION ACTIVITY CODES

Type of Facility	Status of Waste Source	Code Number
No Plant	Discharging raw sewage-build primary and secondary plant	01
Primary Plant	Not suitable for upgrading to secondary, build a new secondary plant	02
	Suitable for upgrading to secondary, if overloaded build secondary for overload	04
Intermediate Plant	Not suitable for upgrading to secondary, build a new secondary plant	03
	Suitable for upgrading to secondary, if overloaded build secondary for overload	05
Secondary Plant	Condition Good - if overloaded build secondary for overload only	06
	Condition Fair to Poor - if not overloaded continue to use	07
	Condition Fair to Poor - If overloaded build new secondary for total load	08
Any Plant or No Plant	Do not build or reconstruct, plant to be shut down and load picked up by another plant (load has been added to other unit)	09
	Replace septic tanks with new plant and collection system	10

APPENDIX C

COST ESTIMATING PROCEDURES

Estimated costs of needed municipal construction activities were developed, using as a basis an unpublished study of sewage treatment needs in the Hudson River basin above Chelsea, New York.[1/] This study presented a sliding scale of unit cost by population served and by type of construction required.

In developing cost estimates, it was recognized that waste treatment facilities constructed in the immediate future should be designed for anticipated population growth through 1990, to allow for a plant life of 20 years. However, since no data are available to provide reasonable projections of sewered population on an individual plant basis, estimates were prepared for the region as a whole and then adjusted to reflect the needed additional capacity.

A basic cost was calculated for each municipal plant, using the present population served, the needed construction activity and the unit cost data. The results were summed for each priority and construction activity code and corrected by the FWPCA construction cost index projected to 1970. A 20 percent factor was then added to cover engineering, legal and other services, after which the cost estimates were revised to reflect the anticipated regional growth through 1990. Cost estimates for ancillary works, such as interceptor sewers, pumping stations and force mains were calculated as 83 percent of the treatment plant cost, based on the Study referred to above.

Industrial cost estimates were prepared by assuming equivalency between the costs of industrial and municipal plants to treat the same magnitude of organic loadings, expressed in terms of population equivalents, with the results projected to 1990 on the basis of anticipated growth of industrial water use. Ancillary works, such as process changes and segregation of wastes, were estimated as 50 percent of the treatment plant cost.

1/ Basic Data Branch, DWSPC, Public Health Service (now Division of Pollution Surveillance, Technical Programs, FWPCA) August 10, 1965, Subject "Sewage Treatment Needs in Hudson River Basin above Chelsea"

APPENDIX D

CONCLUSIONS AND RECOMMENDATIONS OF CONFERENCE IN THE MATTER OF POLLUTION OF THE HUDSON RIVER AND ITS TRIBUTARIES - NEW YORK AND NEW JERSEY, SEPTEMBER 28, 29, 30, 1965

1. The Hudson River and its tributaries, considered by this conference, are interstate waters within the meaning of the Federal Water Pollution Control Act.

2. There is interstate pollution of these waters. This pollution is subject to abatement under the Federal Water Pollution Control Act.

3. Such pollution is caused by many factors including sewage and industrial waste discharges, oil, silt, sediment, heat, floating solids, nutrients, sludge deposits, and combined sewer overflows. Sources of pollution are in both New Jersey and New York.

4. This pollution interferes with recreation, commercial fishing, sport fishing, navigation, domestic and industrial water supplies, and esthetic values.

5. The States of New Jersey and New York and the Interstate Sanitation Commission are empowered to abate pollution and have active programs to accomplish this result. These programs include: establishment of water quality requirements; enforcement actions to abate waste discharges; development of comprehensive water pollution control programs; and fiscal incentives.

6. Delays in abating pollution are caused by the lack of adequate treatment facilities and the complex technical and financial problems presented by the use of a waterway serving the largest metropolitan area in the country.

7. Cognizance is taken of the activities of the U. S. Army Corps of Engineers and the Coast Guard in abating pollution resulting from oil, sludge, silt and floating debris, as well as the program of the Federal Government to abate pollution from all Federal installations.

The Federal Water Pollution Control Administration shall advise and consult with other Federal agencies in the area covered by the conference to see that all Federal installations install, construct and operate adequate pollution control facilities which will meet the requirements of the States and Interstate Sanitation agency concerned, as well as the Federal Government.

The States and Interstate Agency recognize that the Federal Water Pollution Control Administration is the Federal agency primarily charged with the abatement of pollution of interstate or navigable waters. They recommend that the Administration take the lead in coordinating the activities of all Federal agencies concerned with water quality in the Hudson River and its tributaries so that the Federal Government may have a unified approach in dealing with the States and Interstate agency.

8. The benefits which would result from increased State water pollution control activities under such programs as the proposed $1 billion "Pure Water" Bond Issue in New York State are acknowledged.

9. All discharge sources to the Hudson River and its tributaries, whether public, Federal installations, or industrial, shall receive a minimum of secondary treatment or its equivalent, and effective disinfection of the effluents as required to protect water uses.

10. Industrial plants shall improve practices for the segregation and treatment of wastes to effect the maximum reduction of the following:

a) Acids and alkalis;
b) Oil and tarry substances;
c) Phenolic compounds and organic compounds that contribute to taste and odor problems;
d) Nutrient materials including ammonia and nitrogenous phosphoric compounds;
e) Suspended material;
f) Toxic and highly colored wastes;
g) Oxygen requiring substances;
h) Heat;
i) Foam producing discharges;
j) Other wastes which detract from recreation uses, esthetic enjoyment or other beneficial uses of the waters.

11. Surveillance and monitoring of the operation and maintenance of sewage and waste treatment facilities in the conference area shall be conducted by the States of New Jersey, New York, the Interstate Sanitation Commission, and the Federal Water Pollution Control Administration at locations and frequencies to yield reliable values of waste outputs and resulting receiving water quality, and to show their variations.

12. The Federal conferee recommends the following time schedule for the foregoing remedial program:

a) Designs for remedial facilities completed by January 1, 1967;
b) Financing arrangements completed by April 1, 1967;
c) Construction started by July 1, 1967;
d) Construction completed and plants placed into operation by January 1, 1970;

e) Commensurate schedules should be adopted for the interception and treatment of industrial wastes and wastes from Federal installations;
f) Existing schedules calling for earlier completion dates are to be met.

13. The magnitude of the pollution problem caused by discharges from combined sewer overflows is recognized. The Federal Water Pollution Control Administration, in cooperation with the States of New Jersey, New York, and the Interstate Sanitation Commission, will undertake a review of the problem and develop a program for action for consideration by the Federal Government, the States and the Interstate Sanitation Commission by December 31, 1968.

The construction of combined sewer systems in newly developed or redeveloped urban areas shall be prohibited, and existing combined sewers shall be eliminated wherever feasible.

Programs shall be established for surveillance of existing combined sewer systems and flow regulating structures to convey the maximum practicable amount of combined flows to an through treatment plants.

14. The conferees representing New Jersey, New York and the Interstate Sanitation Commission call attention to the fact that financing is the key to sewage treatment plant construction. In the past, the financial burden for construction of sewage treatment facilities has been borne by municipalities and industry. This method of financing must be changed if the progress visualized in this conference is to be achieved.

15. Regional planning is often the most logical and economical approach towards meeting water pollution problems. The water pollution control agencies of New Jersey, New York, and the Interstate Sanitation Commission, and the Federal Water Pollution Control Adminstration will encourage such regional planning activities.

APPENDIX E

CONCLUSIONS AND RECOMMENDATIONS OF CONFERENCE IN THE MATTER OF POLLUTION OF RARITAN BAY AND ADJACENT INTERSTATE WATERS, JUNE 13, 14, 1967

1. Pollution of the interstate waters of Raritan Bay and its tributaries is occurring due to the discharge of inadequately treated municipal and industrial wastes.

2. Considerable progress has been made towards abating the pollution problem.

3. Progress has not been more rapid because of the complexity of the discharges and the difficulties in dealing with controlling pollution in an estuarine system of waters such as exists in Raritan Bay.

4. Still more has to be done to abate pollution of the Raritan Bay area, even though most wastes in the area are now receiving treatment.

5. All wastes prior to discharge into waters covered by this conference, including the Raritan Bay, Arthur Kill, and the Raritan River system, shall be treated to a degree providing as a minimum 80 percent reduction of biochemical oxygen demand at all times, including any four-hour period of a day when the strength of the wastes to be treated might be expected to exceed average conditions. It is recognized that this will require a design of an average removal of 90 percent of biochemical oxygen demand.

6. Effective year-round effluent disinfection shall be provided at all municipal plants and all industrial plants with bacterial discharges.

7. Industrial treatment facilities to accomplish such reduction shall provide removals at least the equivalent of those required for municipal treatment plants.

8. Facilities and procedures are to be established to provide laboratory control for each treatment facility.

9. The schedule for remedial action is as follows:

That which has been proposed by the States of New York and New Jersey and has largely been included in orders and stipulations by those States.

This means that the schedules for remedial action by New York and New Jersey have been accepted by the conferees. All of the improvements will be in operation between 1967 and 1970, except that the expansion of one plant will be in operation by 1971, and one interceptor will be completed in 1972.

10. The conferees shall meet every six months to review and evaluate progress on water quality improvement.

11. The conferees have appointed a technical committee to further evaluate the effects of the shipping channel through Raritan Bay and dredging on water quality. The committee shall consist of Mr. David H. Wallace, Director of Marine Fisheries, New York State Conservation Department, Chairman; and Mr. George Cowherd, Assistant Chief Engineer, Interstate Sanitation Commission; Anthony Ricigliano, Supervising Public Health Engineer, New Jersey State Department of Health; and Mr. Paul De Falco, Deputy Director, Federal Water Pollution Control Administration.

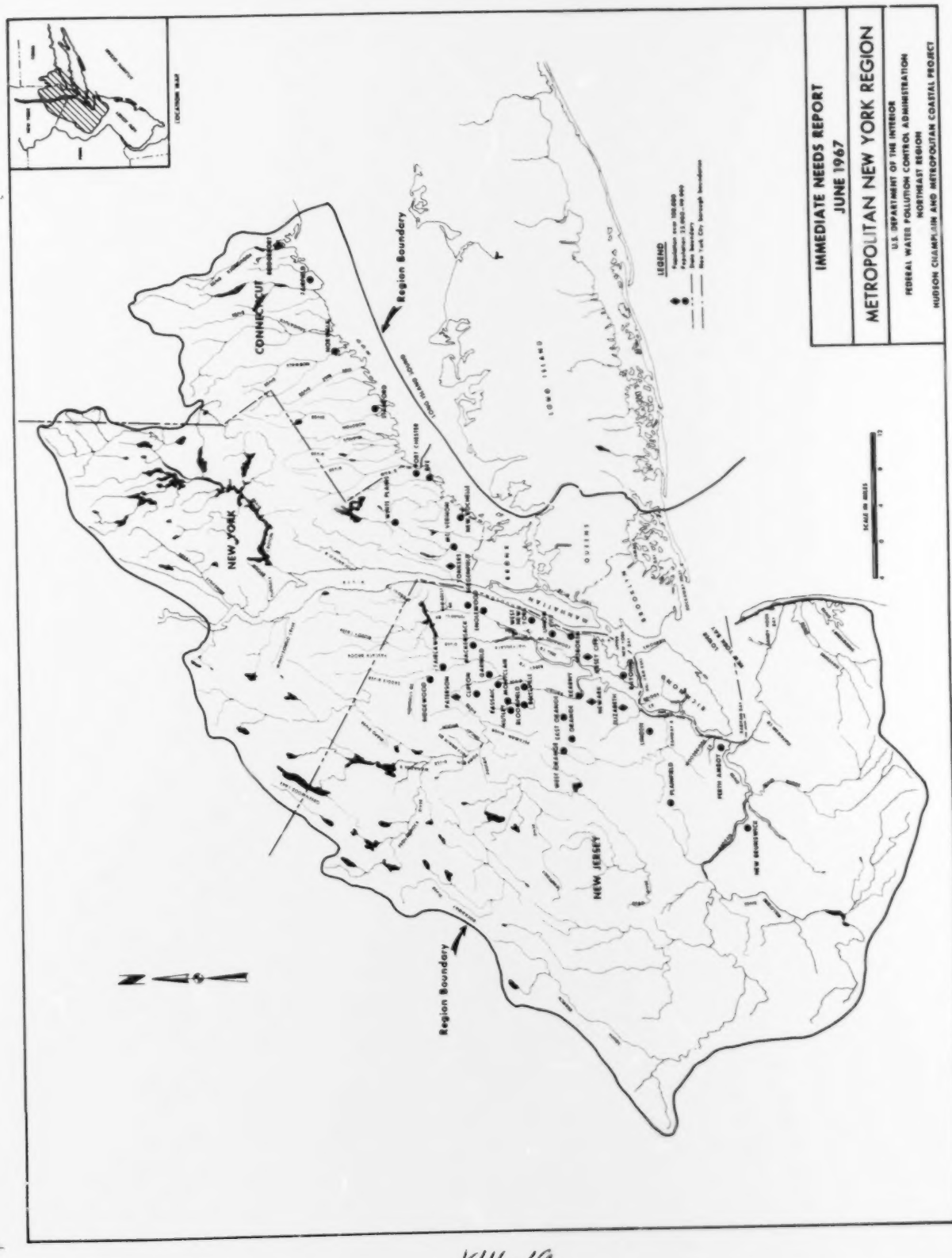

IMMEDIATE NEEDS REPORT
JUNE 1967
METROPOLITAN NEW YORK REGION
U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION
HUDSON CHAMPLAIN AND METROPOLITAN COASTAL PROJECT
LEGEND
LOCATION MAP
Region Boundary
Region Boundary
CONNECTICUT
NEW YORK
NEW JERSEY
LONG ISLAND
SCALE IN MILES

FIGURE 2